Dell Latitude 5420 Rugged

Service Manual

Notes, cautions, and warnings

(i) **NOTE:** A NOTE indicates important information that helps you make better use of your product.

⚠ **CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.**

⚠ **WARNING: A WARNING indicates a potential for property damage, personal injury, or death.**

Contents

Working on your computer

Topics:

- Safety instructions
- Turning off your computer
- Before working inside your computer
- After working inside your computer

Safety instructions

Use the following safety guidelines to protect your computer from potential damage and to ensure your personal safety. Unless otherwise noted, each procedure included in this document assumes that the following conditions exist:

- You have read the safety information that shipped with your computer.
- A component can be replaced or, if purchased separately, installed by performing the removal procedure in reverse order.

⚠ **WARNING: Before working inside your computer, read the safety information that shipped with your computer. For additional safety best practices information, see the Regulatory Compliance Homepage**

⚠ **CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.**

⚠ **CAUTION: To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface at the same time as touching a connector on the back of the computer.**

⚠ **CAUTION: Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a processor by its edges, not by its pins.**

⚠ **CAUTION: When you disconnect a cable, pull on its connector or on its pull-tab, not on the cable itself. Some cables have connectors with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before you disconnect the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, ensure that both connectors are correctly oriented and aligned.**

ⓘ **NOTE:** Disconnect all power sources before opening the computer cover or panels. After you finish working inside the computer, replace all covers, panels, and screws before connecting to the power source.

ⓘ **NOTE:** The color of your computer and certain components may appear differently than shown in this document.

Safety precautions

The safety precautions chapter details the primary steps to be taken before performing any disassembly instructions.

Observe the following safety precautions before you perform any installation or break/fix procedures involving disassembly or reassembly:

- Turn off the system and all attached peripherals.
- Disconnect the system and all attached peripherals from AC power.
- Disconnect all network cables, telephone, and telecommunications lines from the system.
- Use an ESD field service kit when working inside any notebook to avoid electrostatic discharge (ESD) damage.
- After removing any system component, carefully place the removed component on an anti-static mat.

- Wear shoes with non-conductive rubber soles to reduce the chance of getting electrocuted.

Standby power

Dell products with standby power must be unplugged before you open the case. Systems that incorporate standby power are essentially powered while turned off. The internal power enables the system to be remotely turned on (wake on LAN) and suspended into a sleep mode and has other advanced power management features.

Unplugging, pressing and holding the power button for 15 seconds should discharge residual power in the system board. Remove the battery from notebooks.

Bonding

Bonding is a method for connecting two or more grounding conductors to the same electrical potential. This is done through the use of a field service electrostatic discharge (ESD) kit. When connecting a bonding wire, ensure that it is connected to bare metal and never to a painted or non-metal surface. The wrist strap should be secure and in full contact with your skin, and ensure that you remove all jewelry such as watches, bracelets, or rings prior to bonding yourself and the equipment.

Electrostatic discharge—ESD protection

ESD is a major concern when you handle electronic components, especially sensitive components such as expansion cards, processors, memory DIMMs, and system boards. Very slight charges can damage circuits in ways that may not be obvious, such as intermittent problems or a shortened product life span. As the industry pushes for lower power requirements and increased density, ESD protection is an increasing concern.

Due to the increased density of semiconductors used in recent Dell products, the sensitivity to static damage is now higher than in previous Dell products. For this reason, some previously approved methods of handling parts are no longer applicable.

Two recognized types of ESD damage are catastrophic and intermittent failures.
- **Catastrophic** – Catastrophic failures represent approximately 20 percent of ESD-related failures. The damage causes an immediate and complete loss of device functionality. An example of catastrophic failure is a memory DIMM that has received a static shock and immediately generates a "No POST/No Video" symptom with a beep code emitted for missing or nonfunctional memory.
- **Intermittent** – Intermittent failures represent approximately 80 percent of ESD-related failures. The high rate of intermittent failures means that most of the time when damage occurs, it is not immediately recognizable. The DIMM receives a static shock, but the tracing is merely weakened and does not immediately produce outward symptoms related to the damage. The weakened trace may take weeks or months to melt, and in the meantime may cause degradation of memory integrity, intermittent memory errors, etc.

The more difficult type of damage to recognize and troubleshoot is the intermittent (also called latent or "walking wounded") failure.

Perform the following steps to prevent ESD damage:
- Use a wired ESD wrist strap that is properly grounded. The use of wireless anti-static straps is no longer allowed; they do not provide adequate protection. Touching the chassis before handling parts does not ensure adequate ESD protection on parts with increased sensitivity to ESD damage.
- Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and workbench pads.
- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the anti-static packing material until you are ready to install the component. Before unwrapping the anti-static packaging, ensure that you discharge static electricity from your body.
- Before transporting a static-sensitive component, place it in an anti-static container or packaging.

ESD field service kit

The unmonitored Field Service kit is the most commonly used service kit. Each Field Service kit includes three main components: anti-static mat, wrist strap, and bonding wire.

Components of an ESD field service kit

The components of an ESD field service kit are:

- **Anti-Static Mat** – The anti-static mat is dissipative and parts can be placed on it during service procedures. When using an anti-static mat, your wrist strap should be snug and the bonding wire should be connected to the mat and to any bare metal on the system being worked on. Once deployed properly, service parts can be removed from the ESD bag and placed directly on the mat. ESD-sensitive items are safe in your hand, on the ESD mat, in the system, or inside a bag.
- **Wrist Strap and Bonding Wire** – The wrist strap and bonding wire can be either directly connected between your wrist and bare metal on the hardware if the ESD mat is not required, or connected to the anti-static mat to protect hardware that is temporarily placed on the mat. The physical connection of the wrist strap and bonding wire between your skin, the ESD mat, and the hardware is known as bonding. Use only Field Service kits with a wrist strap, mat, and bonding wire. Never use wireless wrist straps. Always be aware that the internal wires of a wrist strap are prone to damage from normal wear and tear, and must be checked regularly with a wrist strap tester in order to avoid accidental ESD hardware damage. It is recommended to test the wrist strap and bonding wire at least once per week.
- **ESD Wrist Strap Tester** – The wires inside of an ESD strap are prone to damage over time. When using an unmonitored kit, it is a best practice to regularly test the strap prior to each service call, and at a minimum, test once per week. A wrist strap tester is the best method for doing this test. If you do not have your own wrist strap tester, check with your regional office to find out if they have one. To perform the test, plug the wrist-strap's bonding-wire into the tester while it is strapped to your wrist and push the button to test. A green LED is lit if the test is successful; a red LED is lit and an alarm sounds if the test fails.
- **Insulator Elements** – It is critical to keep ESD sensitive devices, such as plastic heat sink casings, away from internal parts that are insulators and often highly charged.
- **Working Environment** – Before deploying the ESD Field Service kit, assess the situation at the customer location. For example, deploying the kit for a server environment is different than for a desktop or portable environment. Servers are typically installed in a rack within a data center; desktops or portables are typically placed on office desks or cubicles. Always look for a large open flat work area that is free of clutter and large enough to deploy the ESD kit with additional space to accommodate the type of system that is being repaired. The workspace should also be free of insulators that can cause an ESD event. On the work area, insulators such as Styrofoam and other plastics should always be moved at least 12 inches or 30 centimeters away from sensitive parts before physically handling any hardware components
- **ESD Packaging** – All ESD-sensitive devices must be shipped and received in static-safe packaging. Metal, static-shielded bags are preferred. However, you should always return the damaged part using the same ESD bag and packaging that the new part arrived in. The ESD bag should be folded over and taped shut and all the same foam packing material should be used in the original box that the new part arrived in. ESD-sensitive devices should be removed from packaging only at an ESD-protected work surface, and parts should never be placed on top of the ESD bag because only the inside of the bag is shielded. Always place parts in your hand, on the ESD mat, in the system, or inside an anti-static bag.
- **Transporting Sensitive Components** – When transporting ESD sensitive components such as replacement parts or parts to be returned to Dell, it is critical to place these parts in anti-static bags for safe transport.

ESD protection summary

It is recommended that all field service technicians use the traditional wired ESD grounding wrist strap and protective anti-static mat at all times when servicing Dell products. In addition, it is critical that technicians keep sensitive parts separate from all insulator parts while performing service and that they use anti-static bags for transporting sensitive components.

Transporting sensitive components

When transporting ESD sensitive components such as replacement parts or parts to be returned to Dell, it is critical to place these parts in anti-static bags for safe transport.

Lifting equipment

Adhere to the following guidelines when lifting heavy weight equipment:

⚠ **CAUTION: Do not lift greater than 50 pounds. Always obtain additional resources or use a mechanical lifting device.**

1. Get a firm balanced footing. Keep your feet apart for a stable base, and point your toes out.
2. Tighten stomach muscles. Abdominal muscles support your spine when you lift, offsetting the force of the load.
3. Lift with your legs, not your back.
4. Keep the load close. The closer it is to your spine, the less force it exerts on your back.
5. Keep your back upright, whether lifting or setting down the load. Do not add the weight of your body to the load. Avoid twisting your body and back.
6. Follow the same techniques in reverse to set the load down.

Turning off your computer

Turning off your — Windows

⚠ **CAUTION: To avoid losing data, save and close all open files and exit all open programs before you turn off your computer .**

1. Click or tap ⊞ .
2. Click or tap ⏻ and then click or tap **Shut down**.

   ⓘ **NOTE:** Ensure that the computer and all attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your operating system, press and hold the power button for about 6 seconds to turn them off.

Turning off your computer — Windows 7

⚠ **CAUTION: To avoid losing data, save and close all open files and exit all open programs before you turn off your computer.**

1. Click **Start**.
2. Click **Shut Down**.

   ⓘ **NOTE:** Ensure that the computer and all attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your operating system, press and hold the power button for about 6 seconds to turn them off.

Before working inside your computer

1. Ensure that your work surface is flat and clean to prevent the computer cover from being scratched.
2. Turn off your computer.
3. If the computer is connected to a docking device (docked), undock it.
4. Disconnect all network cables from the computer (if available).

   ⚠ **CAUTION: If your computer has an RJ45 port, disconnect the network cable by first unplugging the cable from your computer.**

5. Disconnect your computer and all attached devices from their electrical outlets.
6. Open the display.
7. Press and hold the power button for few seconds, to ground the system board.

   ⚠ **CAUTION: To guard against electrical shock unplug your computer from the electrical outlet before performing Step # 8.**

   ⚠ **CAUTION: To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface at the same time as touching a connector on the back of the computer.**

8. Remove any installed ExpressCards or Smart Cards from the appropriate slots.

After working inside your computer

After you complete any replacement procedure, ensure that you connect external devices, cards, and cables before turning on your computer.

⚠ **CAUTION: To avoid damage to the computer, use only the battery designed for this particular Dell computer. Do not use batteries designed for other Dell computers.**

1. Connect any external devices, such as a port replicator or media base, and replace any cards, such as an ExpressCard.
2. Connect any telephone or network cables to your computer.

   ⚠ **CAUTION: To connect a network cable, first plug the cable into the network device and then plug it into the computer.**

3. Connect your computer and all attached devices to their electrical outlets.
4. Turn on your computer.

Technology and components

This chapter details the technology and components available in the system.

Topics:

Using your computer

Open the LCD Lid

1. Press LCD latch located on the bottom chassis.
2. Lift the LCD lid at an convenient viewing angle.

ⓘ **NOTE:** Laptops are designed to allow LCD lid movement to a maximum of 180°, however lid should not be opened more than 140°, if the rear I/O ports are in use or when docked.

Stealth mode

Latitude rugged products come equipped with a stealth mode feature. Stealth mode allows you to turn off the display, all the LED lights, internal speakers, the fan and all wireless radios with a single key combination.

ⓘ **NOTE:** This mode is aimed at using the computer in covert operations. When the stealth mode is enabled, the computer remains functional but does not emit any light or sound.

Turning stealth mode on/off

1. Press the Fn+F7 key combination (Fn key not needed if Fn lock is enabled) to turn on stealth mode.

   ⓘ **NOTE:** Stealth mode is a secondary function of the F7 key. The key can be used to perform other functions on the computer when not used with the Fn key to enable stealth mode.

2. All the lights and sounds are turned off.
3. Press the Fn+F7 key combination again to turn off the stealth mode.
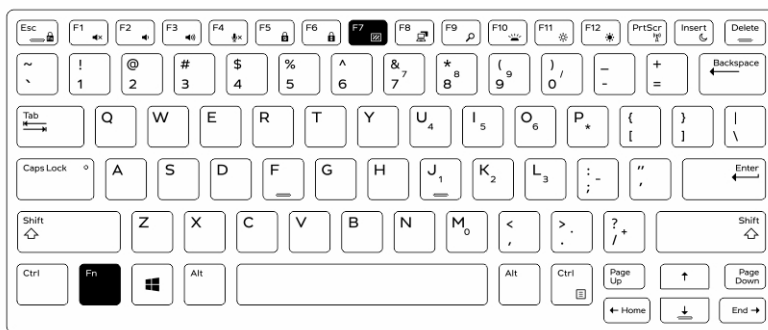
Disabling stealth mode in the system setup (BIOS)

1. Power off the computer.
2. Power on the computer and at the Dell logo, tap the F2 key repeatedly to bring up the **System Setup** menu.
3. Expand and open the **System Configuration** menu.
4. Select **Stealth Mode Control**.

   ⓘ **NOTE:** Stealth mode is enabled by default.

5. To disable stealth mode uncheck the **Enable Stealth Mode** option.
6. Click **Apply changes** and click **Exit**.

Using the backlit keyboard

The Latitude rugged series comes equipped with a backlit keyboard that can be customized. The following colors are enabled:
1. White
2. Red
3. Green
4. Blue

Alternatively, the system can be configured with two additional custom colors in the System Setup (BIOS).

Turning the keyboard backlight on/off or adjusting brightness

To turn the backlight on/off or adjust the backlight brightness settings:

1. To initialize the keyboard backlight switch, press Fn+F10 (the Fn key is not needed if function key Fn lock is enabled).
2. The first use of the preceding key combination turns on the backlight to its lowest setting.
3. Repeated pressing of the key combinations cycles the brightness settings through 25 percent, 50 percent, 75 percent and 100 percent.
4. Cycle through the key combination to either adjust the brightness or turn off the keyboard backlight.
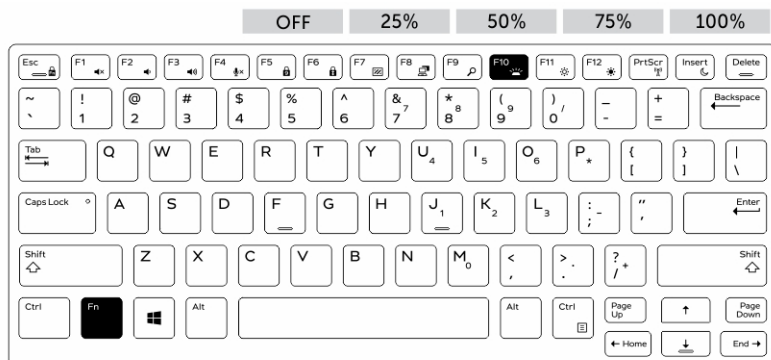
Changing the keyboard backlight color

To change the keyboard backlight color:

1. To cycle through the available backlight colors press Fn+C keys .
2. White, Red, Green and Blue are active by default; up to two custom colors can be added to the cycle in the System Setup (BIOS).
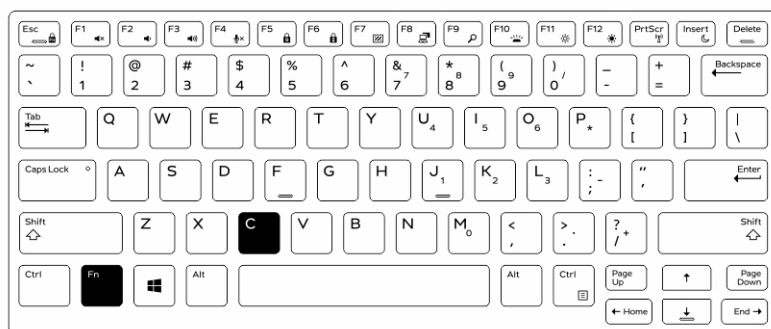
Customizing the backlit keyboard in System Setup (BIOS)

1. Turn off the computer.
2. Turn on the computer and when the Dell logo appears, press the F2 key repeatedly to bring up the System Setup menu.
3. Under **System Configuration** menu, select **RGB Keyboard Backlight**.

   You can enable/disable the standard colors (White, Red, Green and Blue).
4. To set a custom RGB value, use the input boxes on the right side of the screen.
5. Click **Apply changes** and click **Exit** to close System Setup.

Function Fn key lock features

ⓘ **NOTE:** The keyboard has Function key Fn lock capability. When activated, the secondary functions on the top row of keys become default and will not require use of the Fn key.
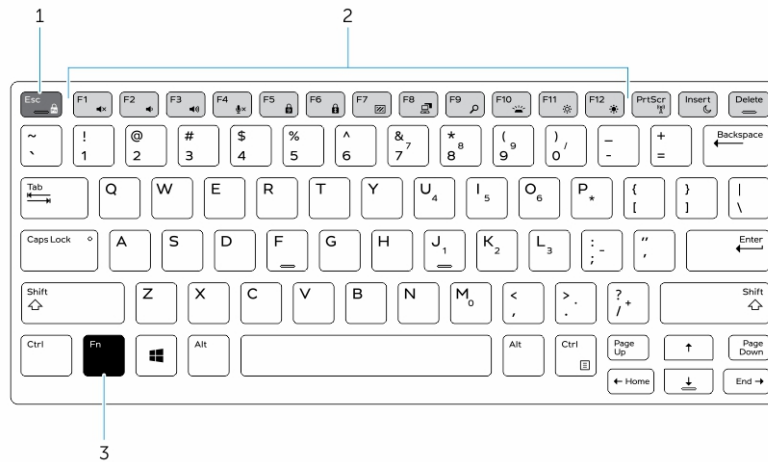
Figure 1. Fn key callouts

1. Fn lock key
2. Affected Fn keys
3. Fn key

(i) **NOTE:** Fn lock affects only the above keys (F1 to F12). Secondary functions will not require the Fn key to be pressed while enabled.

Enabling the Function (Fn) lock

1. Press the Fn+Esc keys.

   (i) **NOTE:** Other secondary function keys on the top row are not affected and requires the use of the Fn key.

2. Press the Fn+Esc keys again to deactivate the function lock feature.
   The function keys return to the default actions.

Enabling and disabling the wireless (WiFi) feature

1. To enable wireless Networking, press Fn + PrtScr.
2. Press Fn + PrtScr again to disable wireless Networking.
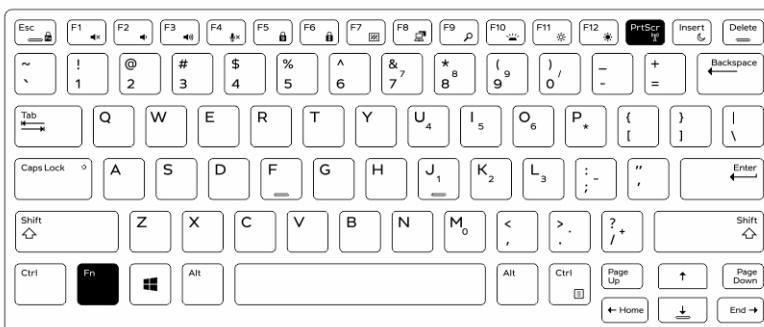
Hot key definition

Fn behavior: Primary behavior is media key; Secondary behavior is F1-F12 key.
- Fn Lock only switches primary and secondary behavior on F1-F12.
- F7 is stealth –unique for rugged and semi rugged platforms. It turns off LCD, all wireless, all alerts, indicator lights, sound, fan, etc

Table 1. Keyboard shortcuts

Hot keys	Function	Description
Fn+ESC	Fn Lock	Allows the user to toggle between **locked** and **unlocked** Fn keys.
Fn+F1	Audio Volume Mute	Temporarily mutes/unmutes the audio. The audio level before muting is returned after unmuting.
Fn+F2	Audio Volume Down/Decrease	Decreases the audio volume until minimum/off is reached.
Fn+F3	Audio Volume Up/Increase	Increases the audio volume until maximum is reached.
Fn+F4	Microphone Mute	Silences the on-board microphone so it cannot record audio. There is an LED on the F4 function key that notifies the user of the state of this feature: ● LED off = microphone capable of recording audio ● LED on = microphone muted and unable to record audio
Fn+F5	Num lock	Allows the user to toggle between **locked** and **unlocked** NumLock
Fn+F6	Scroll lock	Used as Scroll Lock key.
Fn+F7	Stealth Mode	Allows the user to toggle to and from Stealth Mode
Fn+F8	LCD and Projector display	Determines video output to LCD and external Video devices when attached and displays present.
Fn+F9	Search	Mimics the Windows key + F keystroke to open Windows Search dialog box.
Fn+F10	KB Illumination/Backlight	Determines the Keyboard Illumination/Backlight brightness level. The hot key cycles through the following brightness states when pressed: Disabled, Dim, Bright. For more detail, see Keyboard Illumination/Backlight section.
Fn+F11	Brightness Decrease	Decreases the stepping of LCD brightness for each press until minimum is reached. For details, see the LCD Brightness section.
Fn+F12	Brightness Increase	Increases the stepping of LCD brightness for each press until maximum is reached. For details, see the LCD Brightness section.
Fn+PrintScreen	Radio On/Off	Toggles all the wireless radios on and off. For example, WLAN, WWAN, and Bluetooth.

Table 1. Keyboard shortcuts (continued)

Hot keys	Function	Description
Fn+Insert	Sleep	Puts the system into the ACPI S3 State and does not wake the system.

Traditional programming functions like Scroll Lock are assigned to alpha keys with un-printed legends.

- **Fn+S** = Scroll Lock
- **Fn+B** = Pause
- **Fn+Ctrl+B** = Break
- **Fn+R** = Sys-Req

ⓘ **NOTE:** For non-backlit keyboards F10 has no function and icon on function key is purged.

AC-DC Adapters

There are a two types of AC adapters offered for this platform:

- 90W 3-Pin
- 130W 3-Pin
- When you disconnect the AC adapter cable from the computer, grasp the connector, not the cable itself, and then pull firmly but gently to avoid damaging the cable.
- The AC adapter works with electrical outlets worldwide. However, power connectors and power strips vary among countries. Using an incompatible cable or improperly connecting the cable to the power strip or electrical outlet may cause fire or equipment damage.

How to check the status of AC Adapter in BIOS?

1. Restart / Power on your computer.
2. At the first text on the screen or when the Dell logo appears, tap <F2> until the message **Entering Setup** appears.
3. Under **General** > **Battery Information**, you will see **AC Adapter** listed.
4. The **status** shows the **wattage** of the AC adapter connected. Any errors detected with the AC adapter or the DC-In connector will be displayed here.

90W

90W adapter w/ 7.4mm barrel

130W

130W adapter w/
7.4mm barrel

LED and Cable
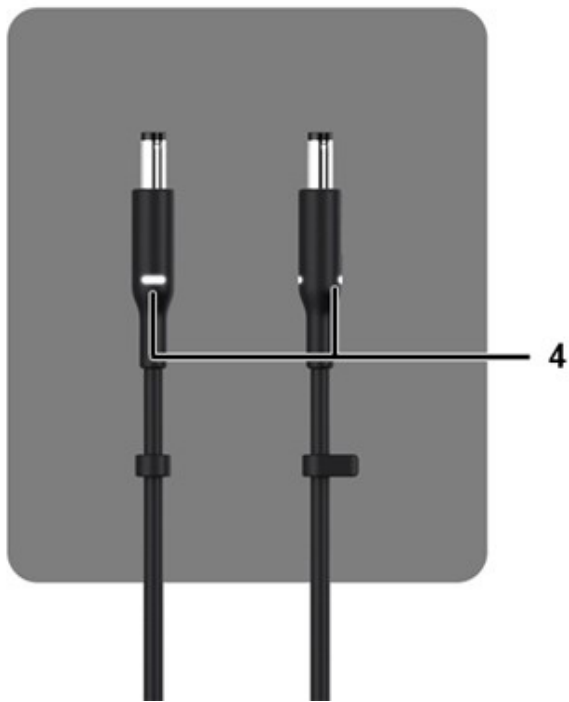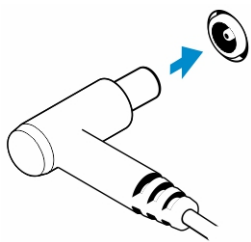
Table 2. Adapter Features

Features	
1	Body shape creates a smooth base for cable wrapping.
2	Cable lock on cord for securing cable wrap.
3	90º strain relief directs the cable out the side of the adapter.
4	Adapter LED is implemented in two spots on opposite sides of the plug head. The LED illumination will be white.

Battery

Dell Latitude Rugged use the following 3-cell battery options:

- 3-cell 51 Whr (ExpressCharge)
- 3-cell 51 Whr (Long-Life Cycle, includes 3 year limited warranty)

The battery is located on the bottom of the system and is hot swap capable. This design is unlike any other Dell predecessors laptops, where system needs to be powered off when the battery is removed, without the need to remove the bottom cover.

ⓘ **NOTE:** Battery is categorized as a CRU (Customer Replaceable Unit) on this platform.

ⓘ **NOTE:** Battery typically requires about 2 hours to fully charge.

Battery Specifications

What is ExpressCharge ?

For a system advertised as having the ExpressCharge feature, the battery typically will have greater than 80% charge after about an hour of charging with the system off and fully charged in about 2 hours with the system off.

Enabling Expresscharge requires that both the system and the battery that is used on the system be ExpressCharge capable. If any of the above requirements is missing, ExpressCharge will not be enabled.

What is BATTMAN?

BATTMAN is a computer controlled battery manager intended for typical rechargeable batteries. It has the following capabilities:

- Monitors self-discharge
- Measures internal resistance
- Automatically performs repeated discharge/charge cycles to break in new batteries
- Keeps a log of all operations performed, which can be imported
- Connects via parallel port to any PC running Microsoft Windows
- Operating software, complete with source code, is available to download

Processors

This laptop is shipped with the following Intel 6th generation i5 SkyLake or 7th and 8th Generation KabyLake processors:

- Intel Core i3, 7130U KabyLake processor
- Intel Core i5, 8350U KabyLake or 6300U SkyLake processors
- Intel Core i7, 8650U KabyLake processor series

(i) **NOTE:** The clock speed and performance varies depending on the workload and other variables.

Skylake processor

Intel Skylake is the successor to the Intel® Broadwell processor. It is a microarchitecture redesign using an already existing process technology and it will be branded as Intel 6th Gen Core. Like Broadwell, Skylake is available in four variants with suffixes SKL-Y, SKL-H, and SKL-U.

The Skylake also includes Core i7, i5, i3, Pentium and Celeron processors.

Skylake vs Broadwell roadmap

The following illustration is a roadmap comparison between the Skylake processor vs the Broadwell processor:
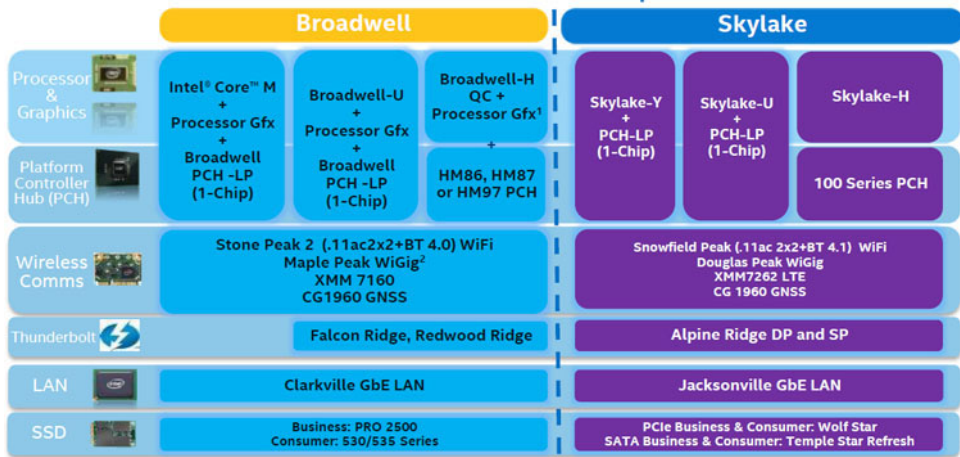
Figure 2. Skylake vs Broadwell roadmap

Processor performance features

The following table illustrates the performance available on each Skylake suffix.

Table 3. Performance features

Feature	Feature description	SKL-Y	SKL-U	SKL-H
General Features	Cores	Dual Core	Dual Core	Dual Core
	CPU/Memory/Graphic Overclocking	No	No	Yes
	Intel Extreme Tuning Utility	No	No	Yes
	Intel Hyper-Threading Technology	Yes	Yes	Yes
	Intel Smart Cache Technology with last level cache (LLC) sharing between Processor and GFx cores	Yes	Yes	Yes

Table 3. Performance features (continued)

Feature	Feature description	SKL-Y	SKL-U	SKL-H
	Intel Smart Sound Technology	Yes	Yes	Yes
	Intel Turbo Boost Technology 2.0	Yes	Yes	Yes
	Last Level Cache (LLC)	Up to 4M	Up to 4M	Up to 4M
	Voltage Optimizer	Yes	TBD	TBD
Display	3 Independent Display Support	Yes	Yes	Yes
	HDMI 2.0 Display @60Hz	3840x2160	3840x2160	3840x2160
	DP/eDP Display @60Hz	3840x2160	4096x2304	4096x2304
	eDP 1.3, support for MPO, NV12	Yes	Yes	Yes
Media	Intel Built-In Visuals	Yes	Yes	Yes
Compute	OpenCL 2.0	Yes	No	yes
Platform Hardware	14nm process	Yes	Yes	Yes
	16PCIe Graphic lanes (configurable as 1x16 or 2x8 or 1x8+2x4)	No	No	Yes
	PCIe Gen3.0 support	No	No	Yes
	Switchable graphics (muxless solution)	No	Yes	Yes
Memory	Memory Type	DDR4	DDR4	DDR4
	Connector / Memory Down	Memory down	SODIMM	SODIMM
	Speed	2133MT/s for DDR4	2133MT/s for DDR4	2133MT/s for DDR4
	Max Capacity	32 GB	32 GB	32 GB
OS Support	Windows 10 (64-bit)	Yes	Yes	Yes
	Windows 7 (64-bit / 32bit)	Yes	Yes	Yes
	Windows 8.1 (64-bit)	Yes	Yes	Yes
	Linux (kernel and associated modules)	Yes	Yes	Yes
	Chrome	Yes	Yes	No
	Android	No	No	No

General comparison with Broadwell processor

	Broadwell Platform Features	Skylake Platform Features
Performance	Improved CPU & Graphics performance (upto 50%) with significant power reduction (upto 40% lower SOC power) and longer battery life[1]	Improved CPU & Graphics performance (upto 50%) with significant power reduction (upto 60% lower SOC power) and longer battery life[1]
Thermals	H: 47W[2], U: 28W[2], U: 15W[2], Y: 4.5W[2] TDP Configurable TDP[3], Low Power Mode[3]	H: 45W[2] and 35W, U: 28W[2], U: 15W[2], Y: 4.5W[2] TDP Configurable TDP[3], Low Power Mode[3]
Graphics	Gen8, DX11.1, Open CL 1.2/2.0[3,4], Open GL 4.x, PCIe3.0	Gen9 LP, DX11.3, DX12, Open CL 1.2/2.0[3,4], Open GL 4.3/4.4, PCIe3.0
Media	Faster AVC and MPEG-2 with full HW encode; VP8 Encode (GPU), VP8 Decode, VP9 Decode (GPU), HEVC Decode; Intel® Quick Sync Video; 3 simultaneous Displays,	VP8 Encode, VP8 Decode, VP9 Decode (GPU), VP9 Encode (GPU), HEVC 8b Decode; HEVC 8b Encode, VDENC, SFC Intel® Quick Sync Video; 3 simultaneous Displays
Audio	Intel® Smart Sound Technology[3]	Enhanced Intel® Smart Sound Technology: GMM HW accelerated Speech, Enhanced Audio Pre and Post Processing, Enhanced Intel® Wake on Voice
2D Camera Imaging	Discrete ISP in camera module	Integrated ISP (U,Y), supporting upto 16MP, 4K@30fps, 1080p@60fps
RealSense 3D Cameras	Intel® RealSense F200 (UF Camera)	Intel® RealSense R200 (WF camera)[3], Intel® RealSense F200 (UF Camera)
I/O & Storage	USB 3.0[3], Thunderbolt™ Technology[5]	PCIe Gen3.0 (U and Y), eMMC5.0[8], SDXC3.0, USB OTG[10], CSI2 MIPI, USB 3.0[3], Thunderbolt™ Technology[5]
Touch and Sensing	Discrete Touch, Discrete Sensor Hub controllers on platform	Integrated Touch[3] processing, Intel® Integrated Sensor Solution
Wireless	High Bandwidth 802.11 ac, WiGig[6] Cat4 LTE, Intel® Wireless Display 5.0[3], GNSS, NFC	High Bandwidth 802.11 ac, WiGig[6], Cat6 LTE, Intel® Wireless Display 6.0[3] Wireless Charging, GNSS, NFC
Security	McAfee YAP, Boot Guard, Intel® PTT 2.0[3], Intel® IPT[3], Intel® BIOS Guard v2.0[3], Anti-malware Boost (Beacon Pass 2.0)[7]	McAfee YAP w/ Intel® SGX, IPT with MFA Boot Guard, Intel® PTT 3.0[3],Intel® IPT[3], Intel® BIOS Guard v2.0[3]
Enterprise/SMB	Intel® vPro™ Technology w/ AMT 10.0, Intel® Small Business Advantage 3.0, Intel® vPro™ w/ Windows* 8.1 InstantGo*, Intel® Pro WiDi 5.1	Intel® vPro™ Technology w/ AMT 11.0, Small Business Advantage SBA Next Intel® Pro WiDi 6.0, Secure LBS

Figure 3. Comparison with Broadwell processor

Kaby Lake — 7th and 8th Generation Intel Core processors

The 7th and 8th Gen Intel Core processor (Kaby Lake) family is the successor of Sky Lake R. It's main features include:
- Intel 14nm Manufacturing Process Technology
- Intel Turbo Boost Technology
- Intel Hyper Threading Technology
- Intel Built-in Visuals
  - Intel HD graphics - exceptional videos, editing smallest details in the videos
  - Intel Quick Sync Video - excellent video conferencing capability, quick video editing and authoring
  - Intel Clear Video HD - visual quality and color fidelity enhancements for HD playback and immersing web browsing
- Integrated memory controller
- Intel Smart Cache
- Optional Intel vPro technology (on i5/i7) with Active Management Technology 11.6
- Intel Rapid Storage Technology

Table 4. Kaby lake specifications

Processor number	Base Clock Speed	Cache	No. of cores/No. of threads	Power	Memory type	Graphics
Intel Dual Core i3-7130U	2.7 GHz	3 MB	2/4	15 W	DDR4-2400	Intel HD graphics 620
Intel Quad Core i5-8350U	1.7 GHz	6 MB	4/8	15 W	DDR4-2400	Intel UHD graphics 620
Intel Quad-Core i7-8650U	1.9 GHz	8 MB	4/8	15 W	DDR4-2400	Intel UHD graphics 620

Memory features

This laptop supports 4–32 GB DDR4 SDRAM memory, up to 2400 MHz on KabyLake processors and 2133 MHz on SkyLake processors.

DDR4

DDR4 (Double Data Rate fourth generation) memory is a higher-speed successor to the DDR2 and DDR3 technologies and allows up to 512 GB in capacity, compared to the DDR3's maximum of 128 GB per DIMM. DDR4 synchronous dynamic random-

access memory is keyed differently from both SDRAM and DDR to prevent the user from installing the wrong type of memory into the system.

DDR4 needs 20 percent less or just 1.2 volts, compared to DDR3 which requires 1.5 volts of electrical power to operate. DDR4 also supports a new, deep power-down mode that allows the host device to go into standby without needing to refresh its memory. Deep power-down mode is expected to reduce standby power consumption by 40 to 50 percent.

DDR4 Details

There are subtle differences between DDR3 and DDR4 memory modules, as listed below:

Key notch difference

The key notch on a DDR4 module is in a different location from the key notch on a DDR3 module. Both notches are on the insertion edge but the notch location on the DDR4 is slightly different, to prevent the module from being installed into an incompatible board or platform.
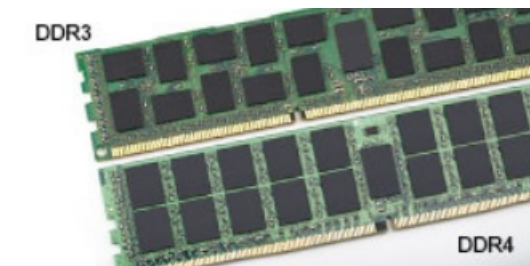

Figure 4. Notch difference

Increased thickness

DDR4 modules are slightly thicker than DDR3, to accommodate more signal layers.
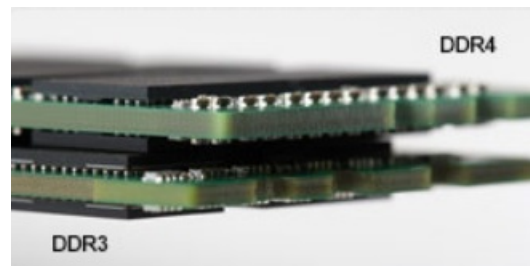

Figure 5. Thickness difference

Curved edge

DDR4 modules feature a curved edge to help with insertion and alleviate stress on the PCB during memory installation.
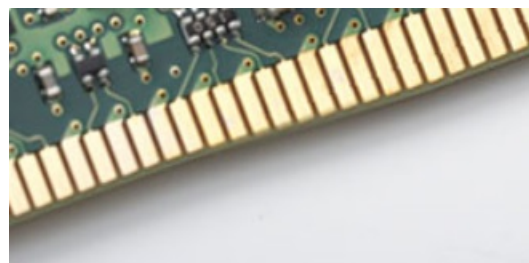

Figure 6. Curved edge

Memory Errors

Memory errors on the system display the new 2 - Amber, 3 - White failure code. If all memory fails, the LCD does not turn on. Troubleshoot for possible memory failure by trying known good memory modules in the memory connectors on the bottom of the system or under the keyboard, as in some portable systems.

Graphics options

Graphics Specifications

Table 5. Graphics specifications

Controller	Type	CPU Dependency	Graphics memory type	Capacity	External display support	Maximum resolution
Intel HD 620 Graphics	UMA	Intel Core i3 - 7130U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
Intel UHD 620 Graphics	UMA	Intel Core i5 - 8350U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
Intel HD 520 Graphics	UMA	Intel Core i5-6300U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
AMD Radeon 540	Discrete	Intel Core i5 - 8350U Intel Core i7 - 8650U	Discrete	Dedicated, 2 GB DDR5	HDMI 2.0 Additional video ports via Rear Configurable IO Space ● VGA ● DisplayPort	4096×2304 @60 Hz
AMD Radeon RX540	Discrete	Intel Core i5 - 8350U Intel Core i7 - 8650U	Discrete	Dedicated, 4 GB DDR5	HDMI 2.0 Additional video ports via Rear Configurable IO Space ● VGA ● DisplayPort	4096×2304 @60 Hz

NOTE: Additional video ports via Rear Configurable IO Space is available with discrete graphics solution only.

Intel HD Graphics Integrated

Intel HD graphics 620

This system can be configured with either of the following UMA graphic options or combined with any of the AMD discrete graphics options.

Table 6. Intel HD graphics 620 specification

Integrated Graphics Controller	Intel HD Graphics 620
Bus Type	Internal PCIe
Memory Interface	N/A (unified memory architecture)
Graphics Level	GT2
Estimated Maximum Power Consumption (TDP)	15 W (included in the CPU power)
Display Support	On System: HDMI 2.0 USB Type-C

Table 6. Intel HD graphics 620 specification (continued)

Integrated Graphics Controller	Intel HD Graphics 620
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	Support for DirectX 12, OpenCL 2.0, OpenGL 4.3/4.4, OpenGL ES
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	System ports: Max Digital: (HDMI) 2560x1600, 4096x2304@24 Hz Docked: ● Max Digital: (DisplayPort 1.2) 3840 x2160 @60 Hz ● Max Digital: (SL-DVI) 1920x1080 @60 Hz ● Analog: (VGA) system (14 inch/15 inch) 2048x1152 @60 Hz For 3 displays : up to max resolution each above
Numbers of Displays Supported	● System Ports: 3 displays max with LCD plus 2 displays max on each output (HDMI, USB Type-C) ● Docked: 3 displays max (combo of LCD, VGA, DP, HDMI)

Intel UHD Graphics 620

Table 7. Intel UHD Graphics 620 (8th Generation Intel Core) specification

Integrated Graphics Controller	Intel UHD Graphics 620 (8th Generation Intel Core)
Bus Type	Internal PCIe
Memory Interface	N/A (unified memory architecture)
Graphics Level	GT2
Estimated Maximum Power Consumption (TDP)	15 W (included in the CPU power)
Display Support	On System: HDMI 2.0 USB Type-C
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	DirectX 11 (Windows 7/8.1), DirectX 12 (Windows 10), OpenGL 4.3
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	System ports: ● Max Digital: (HDMI) 4096x2304@24 Hz ● Analog: (VGA) system (14 inches/15 inches) or docking 2048x1152 @60 Hz Docked: ● Max Digital: (DisplayPort 1.2) 3860 x2160 @60 Hz ● Max Digital: (SL-DVI) 1920x1080 @60 Hz ● Analog: (VGA) system (14 inches/15 inches) 2048x1152 @60 Hz For 3 displays: ● (native or docked) up to 1920x1200 max resolution each
Numbers of Displays Supported	● System Ports - 3 displays max with LCD plus 1 display max on each output (HDMI, VGA (14 inches/15 inches) ● Docked - 3 displays max (combo of LCD, VGA, DP, HDMI)

Intel HD Graphics 520

Table 8. Intel HD Graphics 520 Graphics specification

Integrated Graphics Controller	Intel UHD Graphics 620 (8th Generation Intel Core)
Bus Type	Internal PCIe
Memory Interface	N/A (unified memory architecture)
Graphics Level	GT2
Estimated Maximum Power Consumption (TDP)	15 W (included in the CPU power)
Display Support	On System: HDMI 2.0 USB Type-C
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	DirectX 11 (Windows 7/8.1), DirectX 12 (Windows 10), OpenGL 4.3
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	System ports: ● Max Digital: (HDMI) 4096x2304@24 Hz ● Analog: (VGA) system (14 inches/15 inches) or docking 2048x1152 @60 Hz Docked: ● Max Digital: (DisplayPort 1.2) 3860 x2160 @60 Hz ● Max Digital: (SL-DVI) 1920x1080 @60 Hz ● Analog: (VGA) system (14 inches/15 inches) 2048x1152 @60 Hz For 3 displays: ● (native or docked) up to 1920x1200 max resolution each
Numbers of Displays Supported	● System Ports - 3 displays max with LCD plus 1 display max on each output (HDMI, VGA (14 inches/15 inches) ● Docked - 3 displays max (combo of LCD, VGA, DP, HDMI)

Intel HD Graphics 520

The Intel HD Graphics 520 (GT2) is an integrated graphics unit, which can be found in various ULV (Ultra Low Voltage) processors of the Skylake generation. This GT2 version of the Skylake GPU offers 24 Execution Units (EUs) clocked at up to

1050 MHz (depending on the CPU model). Due to its lack of dedicated graphics memory or eDRAM cache, the HD 520 has to access the main memory (2x 64-bit DDR3L-1600/DDR4-2133).

Performance

The exact performance of the HD Graphics 520 depends on various factors like L3 cache size, memory configuration (DDR3/DDR4) and maximum clock rate of the specific model. The fastest versions Core i7-6600U should perform similar to a dedicated GeForce 820M and handles modern games (as of 2015) in low settings.

Features

The revised video engine now decodes H.265/HEVC completely in hardware and more efficiently than before. Displays can be connected using a DP 1.2/eDP 1.3 (max. 3840 x 2160 @ 60 Hz), whereas HDMI is limited to the older version 1.4a (max. 3840 x 2160 @ 30 Hz). However, HDMI 2.0 can be added using a DisplayPort converter. Up to three displays can be controlled simultaneously.

Power Consumption

The HD Graphics 520 can be found in mobile processors specified at 15 W TDP and is therefore suited for compact laptops and Ultrabooks.

Key Specifications

The following table contains the key specifications of the Intel HD Graphics 520:

Table 9. Key specifications

Specification	Intel HD Graphics 520
Codename	Skylake GT2
Architecture	Intel Gen 6 (Skylake)
Pipelines	24 — unified
Core Speed	300 — 1050 (Boost) MHz
Memory Type	DDR3/DDR4
Memory Bus Width	64/128 bit
Shared Memory	Yes
Technology	14 nm
Features	QuickSync
DirectX	DirectX 12 (FL 12_1)
Max. Displays Supported	Up to 3
DP 1.2/eDP 1.3 max. resolution	3840 x 2160 @ 60 Hz
HDMI max. resolution	3840 x 2160 @ 30 Hz

Intel HD/UHD Graphics 620

The Intel HD/UHD Graphics 620 (GT2) is an integrated graphics unit, which can be found in various ULV (Ultra Low Voltage) processors of the Skylake generation. This GT2 version of the Skylake GPU offers 24 Execution Units (EUs) clocked at up to 1050 MHz (depending on the CPU model). Due to its lack of dedicated graphics memory or eDRAM cache, the HD 520 has to access the main memory (2x 64-bit DDR3L-1600/DDR4-2133).

Performance

The exact performance of the HD/UHD Graphics 620 depends on various factors like L3 cache size, memory configuration (DDR3L/DDR4) and maximum clock rate of the specific model.

Features

The revised video engine now decodes H.265/HEVC completely in hardware and more efficiently than before. Displays can be connected using a DP 1.2/eDP 1.3 (max. 3840 x 2160 @ 60 Hz), whereas HDMI is limited to the older version 1.4a (max. 3840 x 2160 @ 30 Hz). However, HDMI 2.0 can be added using a DisplayPort converter. Up to three displays can be controlled simultaneously.

Power Consumption

The HD Graphics 620 can be found in mobile processors specified at 15 W TDP and is therefore suited for compact laptops and Ultrabooks.

Key Specifications

The following table contains the key specifications of the Intel HD Graphics 620:

Table 10. Key specifications

Specification	Intel HD/UHD Graphics 620
Codename	Skylake GT2
Architecture	Intel Gen 6 (Skylake)
Pipelines	24 — unified
Core Speed	300 — 1050 (Boost) MHz
Memory Type	DDR3/DDR4
Memory Bus Width	64/128 bit
Shared Memory	Yes
Technology	14 nm
Features	QuickSync

Table 10. Key specifications (continued)

Specification	Intel HD/UHD Graphics 620
DirectX	DirectX 12 (FL 12_1)
Max. Displays Supported	Up to 3
DP 1.2/eDP 1.3 max. resolution	3840 x 2160 @ 60 Hz
HDMI max. resolution	3840 x 2160 @ 30 Hz

AMD Radeon 540 Graphics

Table 11. Radeon 540 Graphics specifications

Graphics Controller	AMD Radeon 540 Graphics
Graphics memory	2 GB GDDR5
Bus type	PCIe x16 Gen3
Memory Interface	64-bit
Clock Speeds	Up to 1124 MHz
Estimated Maximum Power Consumption (TDP)	50W TGP (GPU + frame buffer)
Display Support	HDMI/mDP/eDP/USB-C
Maximum Color Depth	Maximum 4:4:4 Color Depth:12 (bits per pixel)
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	DirectX 12, OpenGL 4.5
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	• Single DisplayPort 1.4 - 5120 x 2880 @ 60 Hz • Dual DisplayPort 1.4 - 5120 x 2880 @ 60 Hz
Numbers of Display Support	Up to five displays operating at 4096 x 2160 @60 Hz

AMD Radeon RX 540 Graphics

Table 12. Radeon RX 540 graphics specifications

Graphics Controller	AMD Radeon RX 540 Graphics
Graphics memory	4 GB GDDR5
Bus type	PCIe x16 Gen3
Memory Interface	128 bit
Clock Speeds	Up to 1219 MHz
Estimated Maximum Power	50W TGP (GPU + frame buffer)
Display Support	eDP/DVI/ DisplayPort/HDMI
Maximum Color Depth	Maximum 4:4:4 Color Depth:12 (bits per pixel)

Table 12. Radeon RX 540 graphics specifications (continued)

Graphics Controller	AMD Radeon RX 540 Graphics
Maximum Vertical Refresh Rate	Up to 395 Hz at 1920 x 1080 Up to 118 Hz at 3840 x 2160
Operating Systems Graphics/ Video API Support	DirectX 12, OpenGL 4.5
Supported Resolutions and Max Refresh Rates (Hz)	● Max Digital : Single DisplayPort 1.4 - 5120 x 2880 @ 60 Hz (mDP/USB Type-C to DP) ● Max Digital : Dual DisplayPort 1.4 - 5120 x 2880 @ 60 Hz (mDP/USB Type-C to DP)
Numbers of Display Support	Up to five displays operating at 4096 x 2160 @60 Hz

Corning Gorilla Glass

Corning Gorilla Glass 5: Corning's latest composition was formulated to address breakage the #1 consumer complaint, according to Corning's research. The new glass is just as thin and light as previous versions, but has been formulated to deliver dramatically improved native damage resistance allowing improved in-field performance. Corning Gorilla Glass 5 has been tested for performance when subjected to sharp contact damage, such as asphalt and other real-world surfaces.

Benefits

- Enhanced retained strength after use.
- High resistance to scratch and sharp contact damage.
- Improved drop performance.
- Superior surface quality.

Applications

- Ideal protective cover for electronic displays in:
  - Smartphones
  - Laptop and tablet computer screens
  - Wearable devices
- Touchscreen devices
- Optical components
- High strength glass articles

Dimensions

Thickness: 0.7 mm

Viscosity

Table 13. Viscosity

Parameters	Vectors
Softening Point ($10^{7.6}$ poises)	884˚C
Annealing Point ($10^{13.2}$ poises)	623˚C
Strain Point ($10^{14.7}$ poises)	571˚C

Properties

Table 14. Properties

Density	2.43 g/cm
Youngs Modulus	76.7 GPa
Poissons Ratio	0.21
Shear Modulus	31.7 GPa
Vickers Hardness (200 g load)	
• Un-strengthened • Strengthened	489 kgf/mm^2 596 kgf/mm^2 596 kgf/mm^2
Fracture Toughness	0.69 MPa m$^{0.5}$
Coefficient of Expansion (0 ˚C - 300 ˚C)	78.8 x 10^{-7} /°C

Chemical Strengthening

Capability of >850MPa CS, at 50 μm Depth Of Layer(DOL)

Specifications subject to change

Optical

Table 15. Optical

Refractive Index (590 nm)	
Core glass**	1.50
Compression layer	1.51
Photo-elastic constant	30.3 nm/cm/MPa

** Core index is used for FSM-based measurements since it is unaffected by ion-exchange conditions.

Chemical Durability

Durability is measured via weight loss per surface area after immersion in the solvents shown below. Values are highly dependent upon actual testing conditions. Data reported is for Corning Gorilla Glass 5.

Table 16. Chemical Durability

Reagent	Time	Temperature (°C)	Weight Loss (mg/cm2)
HCl - 5%	24 hrs	95	5.9
NH4F:HF - 10%	20 min	20	1.0
HF - 10%	20 min	20	25.2
NaOH - 5%	6 hrs	95	2.7

Electrical

Table 17. Electrical

Frequency (MHz)	Dielectric Constant	Loss Tangent
54	7.08	0.009
163	7.01	0.010
272	7.01	0.011
272	7.00	0.010
490	7.99	0.010
599	7.97	0.011
912	7.01	0.012
1499	6.99	0.012
1977	6.97	0.014
2466	6.96	0.014
2986	6.96	0.014

Terminated coaxial line similar to that outlined in NIST Technical Notes 1520 and 1355-R

Putting Corning Gorilla Glass 5 to the test.

- Greater damage resistance (upto 1.8X) with deep abrasion.
- Faster chemical strengthening with high Compressive Stress and deeper depth of compression
  - Shallower check depth with higher abrasions levels
- Enables thickness reduction

Pen Usage

Your computer uses several input devices. The standard external USB keyboard and mouse are present, plus you can opt for the electrostatic pen/stylus or use your finger as an input device.

Using the Pen as a 'Mouse'

You can use the pen the same way you use a mouse or touch pad with a laptop computer. Holding the pen near the display makes a small cursor appear. Moving the pen moves the cursor. The following table describes how to use the pen.

Table 18. Pen functions

Action	Function
Gently tap the pen tip on the screen	Same as a single-click on a mouse.
Gently tap the pen tip twice in quick succession on the screen.	Same as a double-click on a mouse.
Touch the pen on the screen and hold it in place momentarily until Windows draws a complete circle around the cursor.	Same as a right-click on a mouse.

Using the Pen as a Pen

The handwriting recognition software makes it easy to enter text into your applications with the pen. Some applications, such as Windows Journal, allow you to write with the pen directly into the application window.

Tablet PC Input Panel

When an application does not directly support pen input, you can use the **Tablet PC Input Panel** to enter text into your application. If you tap in an editable area, the Tablet PC Input Panel icon appears. Tapping the icon makes the Input Panel slide out from the edge of the display.

You can move the **Input Panel** tab by dragging it up or down along the edge of the screen. Then, when you tap it, the Input Panel opens at the same horizontal location on the screen that the tab appears.

Pen Flicks

Pen flicks enable you to use the pen to perform actions that normally require a keyboard, such as pressing <Page Up> or using the directional arrow keys. Pen flicks are quick, directional gestures. Draw a short line in one of eight directions. When a pen flick is recognized, the Tablet PC performs the action assigned.
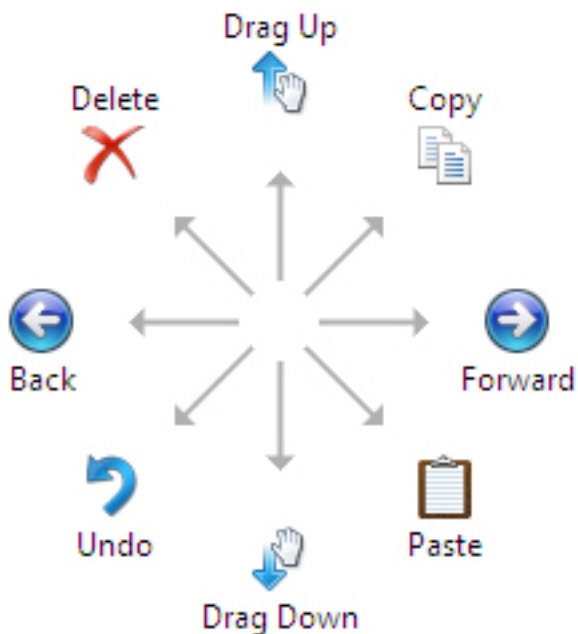
You can modify the default pen flick settings:

1. Click **Start** > **Control Panel** > **Pen and Touch** and click the **Flicks** tab.
2. Modify the settings and click **OK.**
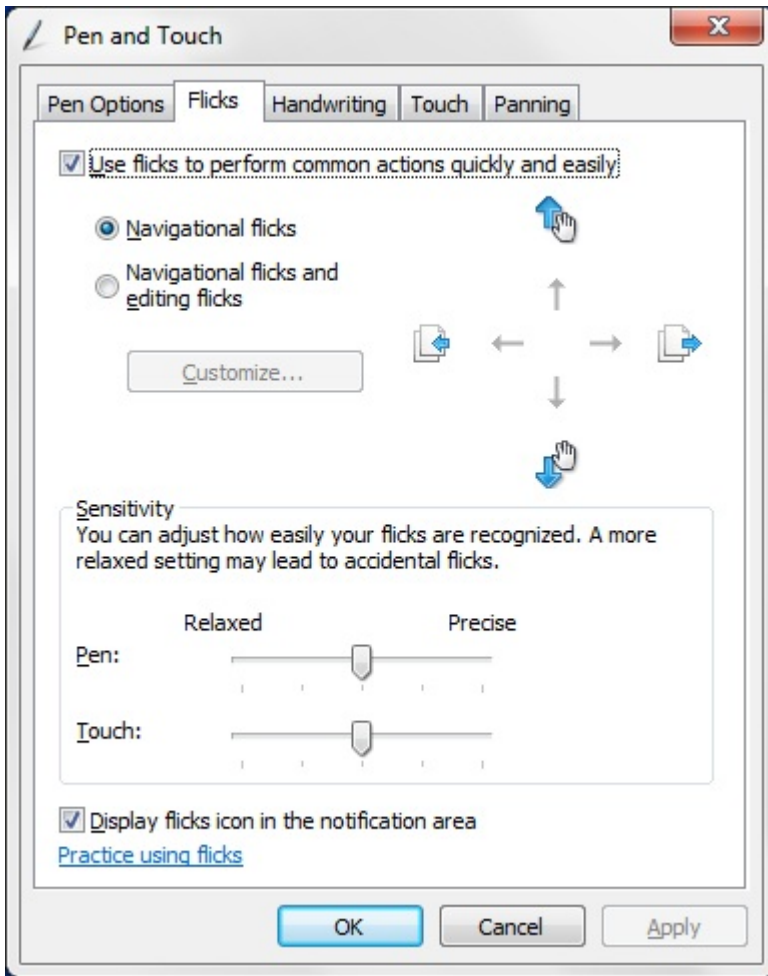
Media Card Readers

(i) **NOTE:** The media card reader is integrated into the system board on portable systems. If there is a hardware failure or the reader malfunctions, replace the system board.

The media card reader expands the usefulness and functionality of portable systems, especially when used with other devices such as digital cameras, portable MP3 players, and handheld devices. All these devices use a form of media card to store information. Media card readers allows for easy transfer of data between these devices.

Several different types of media or memory cards are available today. Below is a list of the different types of cards that work in the media card reader.

SD Card Reader

1. Memory Stick
2. Secure Digital (SD)
3. Secure Digital High Capacity (SDHC)
4. Secure Digital eXtended Capacity(SDXC)

UEFI BIOS

UEFI is an acronym for Unified Extensible Firmware Interface. The UEFI specification defines a new model for the interface between personal computer operating systems and platform firmware. The interface consists of data tables that contain platform related information, plus boot and runtime service calls that are available to the operating system and its loader. Together, these provide a standard environment for booting an operating system and running pre-boot applications. One of the main differences between BIOS and UEFI is the way applications are coded. Assembler was used if functions or applications had to be coded for the BIOS while a higher level language code will be used to program the UEFI.

Dell UEFI BIOS implementation will supersede the existing two different sets of BIOS in the portables and desktop products into one single UEFI BIOS moving forward.

Important Information

There is no difference in between the conventional BIOS and the UEFI BIOS unless the UEFI option is checked in the 'Boot List Option' setting in the BIOS page. This will allow the user to create a UEFI boot option list manually without affecting the existing boot priority list. With the implementation of UEFI BIOS, the changes are more related to the manufacturing tools and functionalities with very minimal impact to the customer's usages.

Few things to remember are:
- If customers have a UEFI boot media and ONLY if they have UEFI boot media (either in the optical media or via USB storage), the one-time boot menu will show an additional section listing the UEFI boot options. If they don't have UEFI boot media attached, they will never see this option. Almost all will never get to see this option unless the UEFI boot option is specified manually through the 'Boot Sequence' settings.
- How to change Service Tag/Owner Tag?

  When the service technician replaces a system board, he's required to set the service tag upon the system starts up at one time off basis. Failure to set a service tag may result system battery not being able to charge. Therefore, it is very important that the service technician set the correct system service tag. If a wrong service tag is set, there's no way to reset it and the technician will have to place order for another system board replacement.

- How to change Asset tag information?

  To change the Asset tag information, we can use one of the following software utilities.

Portables Technology Dell Command Configure toolkit

Customers may also report that after a motherboard replacement, the asset field is already populated in the system BIOS, and needs to be cleared or set. For older systems and all newer systems with the UEFI BIOS platform, customers can download the Dell Command Configure Toolkit (DCC) to customize the BIOS options or even change the ownership or asset tag from within Windows. This technology is described in Software and Troubleshooting section.

Systems management - From on-premises to the cloud

Dell Client Command Suite - a free toolkit available for download, for all OptiPlex and Latitude PCs at https://dell.com/command, automates and streamlines systems management tasks, saving time, money, and resources. It consists of the following modules that can be used independently, or with a variety of systems management consoles such as SCCM.

Dell Command | Deploy enables easy operating system (OS) deployment across all major OS deployment methodologies and provides numerous system-specific drivers that have been extracted and reduced to an OS-consumable state.

Dell Command I Configure is a graphical user interface (GUI) admin tool for configuring and deploying hardware settings in a pre-OS or post-OS environment, and it operates seamlessly with SCCM and Airwatch and can be self-integrated into LANDesk and KACE. Simply, this is all about the BIOS. Command I Configure allows you to remotely automate and configure over 150+ BIOS settings for a personalized user experience.

Dell Command I PowerShell Provider can do the same things as Command I Configure, but with a different method. PowerShell is a scripting language that allows customers to create a customized and dynamic configuration process.

Dell Command I Monitor is a Windows Management Instrumentation (WMI) agent that provides IT admins with an extensive inventory of the hardware and health-state data. Admins can also configure hardware remotely by using command line and scripting.

Dell Command | Update (end-user tool) is factory-installed and allows admins to individually manage and automatically present and install Dell updates to the BIOS, drivers, and software. Command I Update eliminates the time-consuming hunting and pecking process of update installation.

Dell Command I Update Catalog provides searchable metadata that allows the management console to retrieve the latest system-specific updates (driver, firmware or BIOS). The updates are then delivered seamlessly to end-users using the customer's systems management infrastructure that is consuming the catalog (like SCCM).

Dell Command | vPro Out of Band console extends hardware management to systems that are offline or have an un-reachable OS (Dell exclusive features).

Dell Command | Integration Suite for System Center - This suite integrates all the key components of the Client Command Suite into Microsoft System Center Configuration Manager 2012 and Current Branch versions.

Dell Client Command Suite's integration with VMware Workspace ONE Powered by AirWatch, now allows customers to manage their Dell client hardware from the cloud, using a single Workspace ONE console.

Out-of-Band Systems Management- Intel vPro and Intel Standard Manageability

Intel vPro and Intel Standard Manageability must be configured in the Dell factory at the time of purchase, as they are NOT field ungradable. They offer out-of-band management and DASH compliance.

Intel vPro

Available with Intel Core i5 and i7 processors and offers the most complete set of out-of-band management features including KVM, IPv6 support, graceful shutdown, and all the features from previous versions of vPro. It uses the latest version of Intel's Active Management Technology (AMT).

To learn more about vPro, visit Intel's website at https://www.intel.com/content/www/us/en/architecture-and-technology/vpro/vpro-platform-general.html.

A unique and new Dell Remote Provisioning feature for Intel vPro quickly activates vPro capabilities on a PC, reducing vPro set-up time from months to less than an hour. The Dell Remote Provisioning feature for Intel vPro is available as a part of the module: **Dell Command | Integration Suite for Systems Center**

Intel Standard Manageability (ISM)

ISM offers a limited set of out-of-band features like remote power on/off, Serial-over-LAN redirect, Wake-on-LAN, etc.

To learn more about Intel ISM, visit Intel's website at: https://software.intel.com/en-us/blogs/2009/03/27/what-is-standard-manageability.

Trusted Platform Module

Trusted Platform Module (TPM) is a dedicated cryptoprocessor designed to secure hardware by integrating cryptographic keys into devices. A software can use a Trusted Platform Module to authenticate hardware devices. As each TPM chip has a unique and secret RSA key burned in as it is produced, it can perform the platform authentication.

(i) **NOTE:** Trusted Platform Module (TPM) is part of the system board. In an event of system board replacement, the encryption needs to be suspended in the OS and re-enabled on new system board's BIOS prior to resuming the encryption.

⚠️ **CAUTION: Attempt to replace the system board without prior suspending the encryption, will cause operating system corruption and may eventually lead to No-Boot scenario.**

Fingerprint Reader

This topic explains the software used in fingerprint reader

The Portables Technology has an integrated fingerprint reader located on the palm rest to the right of the touch pad. The fingerprint reader is an option, so not all systems have it. Included with the driver for the fingerprint reader is a software package from Dell ControlVault, that provides functionality for the device. Dell provides all support for the software, same as on the Latitude systems.

Dell ControlVault Software

The software package for the fingerprint reader is ControlVault by Dell. It provides the following functionality to the fingerprint reader:

● Uses the fingerprint reader for Windows® logon and system start-up password authentication
● Registers websites and Windows applications for password replacement
● Launches a favorite application with a finger swipe
● Stores confidential information in an encrypted folder

To gain any of this functionality, a user must first enroll fingerprints. An easy-to-follow wizard guides the user through the enrollment process. The user can choose to save fingerprints to the hard drive or the fingerprint reader

ⓘ **NOTE:** A user should enroll more than one finger's print.

USB features

Universal Serial Bus, or USB, was introduced in 1996. It dramatically simplified the connection between host computers and peripheral devices like mice, keyboards, external drivers, and printers.

Table 19. USB evolution

Type	Data Transfer Rate	Category	Introduction Year
USB 2.0	480 Mbps	High Speed	2000
USB 3.0/USB 3.1 Gen 1	5 Gbps	SuperSpeed	2010
USB 3.1 Gen 2	10 Gbps	SuperSpeed	2013

USB 3.0/USB 3.1 Gen 1 (SuperSpeed USB)

For years, the USB 2.0 has been firmly entrenched as the de facto interface standard in the PC world with about 6 billion devices sold, and yet the need for more speed grows by ever faster computing hardware and ever greater bandwidth demands. The USB 3.0/USB 3.1 Gen 1 finally has the answer to the consumers' demands with a theoretically 10 times faster than its predecessor. In a nutshell, USB 3.1 Gen 1 features are as follows:

● Higher transfer rates (up to 5 Gbps)
● Increased maximum bus power and increased device current draw to better accommodate power-hungry devices
● New power management features
● Full-duplex data transfers and support for new transfer types
● Backward USB 2.0 compatibility
● New connectors and cable

The topics below cover some of the most commonly asked questions regarding USB 3.0/USB 3.1 Gen 1.

Speed

Currently, there are 3 speed modes defined by the latest USB 3.0/USB 3.1 Gen 1 specification. They are Super-Speed, Hi-Speed and Full-Speed. The new SuperSpeed mode has a transfer rate of 4.8 Gbps. While the specification retains Hi-Speed, and Full-Speed USB mode, commonly known as USB 2.0 and 1.1 respectively, the slower modes still operate at 480 Mbps and 12 Mbps respectively and are kept to maintain backward compatibility.

USB 3.0/USB 3.1 Gen 1 achieves the much higher performance by the technical changes below:

● An additional physical bus that is added in parallel with the existing USB 2.0 bus (refer to the picture below).
● USB 2.0 previously had four wires (power, ground, and a pair for differential data); USB 3.0/USB 3.1 Gen 1 adds four more for two pairs of differential signals (receive and transmit) for a combined total of eight connections in the connectors and cabling.
● USB 3.0/USB 3.1 Gen 1 utilizes the bidirectional data interface, rather than USB 2.0's half-duplex arrangement. This gives a 10-fold increase in theoretical bandwidth.
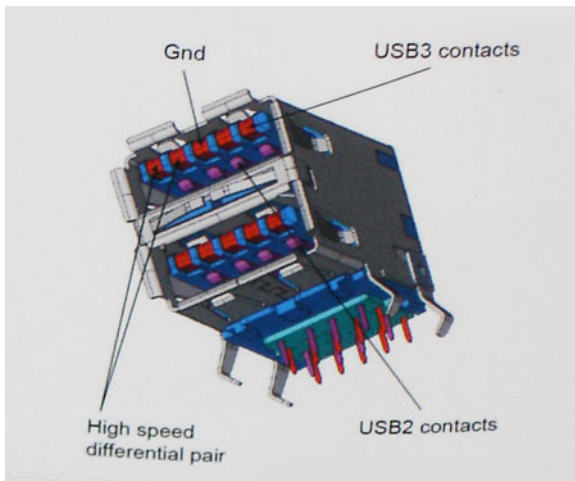
With today's ever increasing demands placed on data transfers with high-definition video content, terabyte storage devices, high megapixel count digital cameras etc., USB 2.0 may not be fast enough. Furthermore, no USB 2.0 connection could ever come close to the 480Mbps theoretical maximum throughput, making data transfer at around 320 Mbps (40 MB/s) — the actual real-world maximum. Similarly, USB 3.0/USB 3.1 Gen 1 connections will never achieve 4.8Gbps. We will likely see a real-world maximum rate of 400MB/s with overheads. At this speed, USB 3.0/USB 3.1 Gen 1 is a 10x improvement over USB 2.0.

Applications

USB 3.0/USB 3.1 Gen 1 opens up the laneways and provides more headroom for devices to deliver a better overall experience. Where USB video was barely tolerable previously (both from a maximum resolution, latency, and video compression perspective), it's easy to imagine that with 5-10 times the bandwidth available, USB video solutions should work that much better. Single-link DVI requires almost 2Gbps throughput. Where 480Mbps was limiting, 5Gbps is more than promising. With its promised 4.8Gbps speed, the standard will find its way into some products that previously weren't USB territory, like external RAID storage systems.

Listed below are some of the available SuperSpeed USB 3.0/USB 3.1 Gen 1 products:

● External Desktop USB 3.0/USB 3.1 Gen 1 Hard Drives
● Portable USB 3.0/USB 3.1 Gen 1 Hard Drives
● USB 3.0/USB 3.1 Gen 1 Drive Docks & Adapters
● USB 3.0/USB 3.1 Gen 1 Flash Drives & Readers
● USB 3.0/USB 3.1 Gen 1 Solid-state Drives
● USB 3.0/USB 3.1 Gen 1 RAIDs

- Optical Media Drives
- Multimedia Devices
- Networking
- USB 3.0/USB 3.1 Gen 1 Adapter Cards & Hubs

Compatibility

The good news is that USB 3.0/USB 3.1 Gen 1 has been carefully planned from the start to peacefully co-exist with USB 2.0. First of all, while USB 3.0/USB 3.1 Gen 1 specifies new physical connections and thus new cables to take advantage of the higher speed capability of the new protocol, the connector itself remains the same rectangular shape with the four USB 2.0 contacts in the exact same location as before. Five new connections to carry receive and transmitted data independently are present on USB 3.0/USB 3.1 Gen 1 cables and only come into contact when connected to a proper SuperSpeed USB connection.

USB Powershare

USB PowerShare is a feature which allows for external USB devices (i.e. cellular phones, portable music players, etc.) to charge using the portable system's battery.

Only the USB connector with a **SS+USB+Battery**--> icon, can be used.

This functionality is enabled in the system setup under the **On Board Devices** heading. You can select how much of the battery's charge can be used as well (pictured below). If you set the USB PowerShare to 25%, the external device is allowed to charge until the battery reaches 25% of full capacity (e.g. 75% of the portable's battery charge is used up).
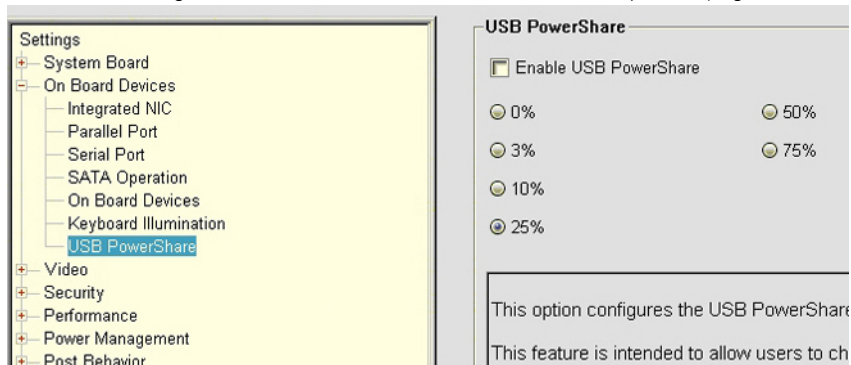
USB Type-C

USB Type-C is a new, tiny physical connector. The connector itself can support various exciting new USB standards like USB 3.1 and USB power delivery (USB PD).

Alternate Mode

USB Type-C is a new connector standard that is very small. It is about a third the size of an old USB Type-A plug. This is a single connector standard that every device should be able to use. USB Type-C ports can support a variety of different protocols using "alternate modes," which allows you to have adapters that can output HDMI, VGA, DisplayPort, or other types of connections from that single USB port

USB Power Delivery

The USB PD specification is also closely intertwined with USB Type-C. Currently, smartphones, tablets, and other mobile devices often use a USB connection to charge. A USB 2.0 connection provides up to 2.5 watts of power — that'll charge your phone, but that's about it. A laptop might require up to 60 watts, for example. The USB Power Delivery specification ups this

power delivery to 100 watts. It's bi-directional, so a device can either send or receive power. And this power can be transferred at the same time the device is transmitting data across the connection.

This could spell the end of all those proprietary laptop charging cables, with everything charging via a standard USB connection. You could charge your laptop from one of those portable battery packs you charge your smartphones and other portable devices from today. You could plug your laptop into an external display connected to a power cable, and that external display would charge your laptop as you used it as an external display — all via the one little USB Type-C connection. To use this, the device and the cable have to support USB Power Delivery. Just having a USB Type-C connection doesn't necessarily mean they do.

USB Type-C and USB 3.1

USB 3.1 is a new USB standard. USB 3's theoretical bandwidth is 5 Gbps, while USB 3.1's is 10 Gbps. That's double the bandwidth, as fast as a first-generation Thunderbolt connector. USB Type-C isn't the same thing as USB 3.1. USB Type-C is just a connector shape, and the underlying technology could just be USB 2 or USB 3.0. In fact, Nokia's N1 Android tablet uses a USB Type-C connector, but underneath it's all USB 2.0 — not even USB 3.0. However, these technologies are closely related.

Ethernet

The Intel I219LM Jacksonville WGI219LM family of Gigabit Ethernet controllers provides compact, single-port integrated physical layer devices that connect to the Intel Skylake chipsets.

The Intel WGI219LM is the corporate LAN product with support for Intel vPro; technology, Intel AMT2, Energy Efficient Ethernet (802.3az), Intel SIPP, and Server OS support.

Product Features

General

- 10 BASE-T IEEE 802.3 specification conformance
- 100 BASE-TX IEEE 802.3 specification conformance
- 1000 BASE-T IEEE 802.3 specification conformance
- Energy Efficient Ethernet (EEE)
- IEEE 802.3az support [Low Power Idle (LPI) mode]
- IEEE 802.3u autonegotiation conformance
- Supports carrier extension (half duplex)
- Loopback modes for diagnostics
- Advanced digital baseline wander correction
- Automatic MDI/MDIX crossover at all speeds of operation
- Automatic polarity correction
- MDC/MDIO management interface
- Flexible filters in PHY to reduce integrated LAN controller power
- Smart speed operation for automatic speed reduction on faulty cable plants
- PMA loopback capable (no echo cancel)
- 802.1as/1588 conformance
- Power Optimizer Support
- Intel Stable Image Platform Program (SIPP)
- Network proxy/ARP Offload support
- Up to 32 programmable filters
- No support for Gb/s half-duplex operation

Security and Manageability

- Intel vPro support with appropriate Intel chipset components

Performance

- Jumbo Frames (up to 9 Kb)
- 802.1Q & 802.1p
- Receive Side Scaling (RSS)
- Two Queues (Tx & Rx)

Power

- Ultra Low Power at cable disconnect (<1 mW) enables platform support for connected standby
- Reduced power consumption during normal operation and power down modes
- Integrated Intel Auto Connect Battery Saver (ACBS)
- Single-pin LAN disable for easier BIOS implementation
- Fully integrated Switching Voltage Regulator (iSVR)
- Low Power LinkUp(LPLU)

MAC/PHY Interconnect

- PCIe-based interface for active state operation (S0 state)
- SMBus-based interface for host and management traffic (Sx low power state)

Package/Design

- 48-pin package, 6x6mm with a 0.4 mm lead pitch and an Exposed Pad for ground
- Three configurable LED outputs
- Integrated MDI interface termination resistors to reduce BOM costs
- Reduced BOM cost by sharing SPI flash with PCH

Intel® Ethernet Connection I219 (Jacksonville)
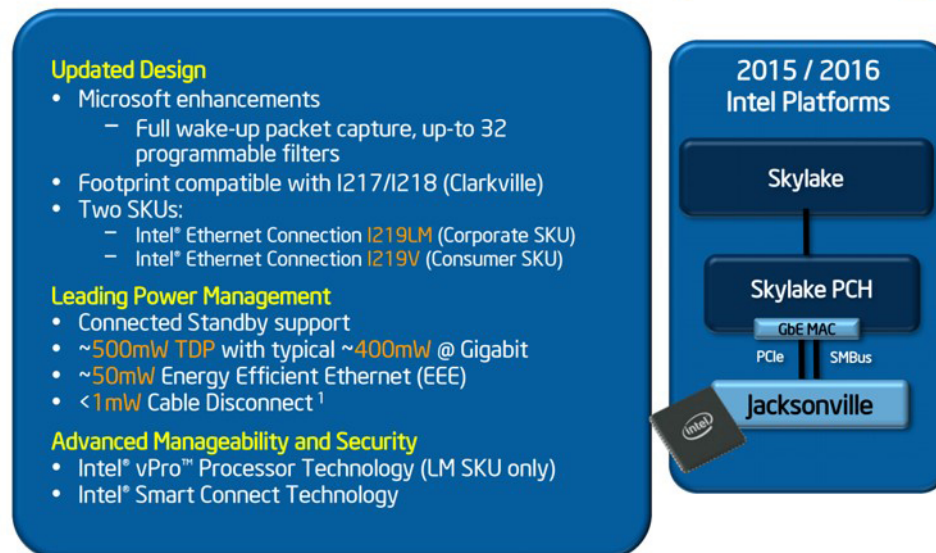
HDMI 2.0

This topic explains the HDMI 2.0 and its features along with the advantages.

HDMI (High-Definition Multimedia Interface) is an industry-supported, uncompressed, all-digital audio/video interface. HDMI provides an interface between any compatible digital audio/video source, such as a DVD player, or A/V receiver and a

compatible digital audio and/or video monitor, such as a digital TV (DTV). The intended applications for HDMI TVs, and DVD players. The primary advantage is cable reduction and content protection provisions. HDMI supports standard, enhanced, or high-definition video, plus multichannel digital audio on a single cable.

HDMI 2.0 Features

- **HDMI Ethernet Channel** - Adds high-speed networking to an HDMI link, allowing users to take full advantage of their IP-enabled devices without a separate Ethernet cable
- **Audio Return Channel** - Allows an HDMI-connected TV with a built-in tuner to send audio data "upstream" to a surround audio system, eliminating the need for a separate audio cable
- **3D** - Defines input/output protocols for major 3D video formats, paving the way for true 3D gaming and 3D home theater applications
- **Content Type** - Real-time signaling of content types between display and source devices, enabling a TV to optimize picture settings based on content type
- **Additional Color Spaces** - Adds support for additional color models used in digital photography and computer graphics
- **4K Support** - Enables video resolutions far beyond 1080p, supporting next-generation displays that will rival the Digital Cinema systems used in many commercial movie theaters
- **HDMI Micro Connector** - A new, smaller connector for phones and other portable devices, supporting video resolutions up to 1080p
- **Automotive Connection System** - New cables and connectors for automotive video systems, designed to meet the unique demands of the motoring environment while delivering true HD quality

Advantages of HDMI

- Quality HDMI transfers uncompressed digital audio and video for the highest, crispest image quality.
- Low -cost HDMI provides the quality and functionality of a digital interface while also supporting uncompressed video formats in a simple, cost-effective manner
- Audio HDMI supports multiple audio formats from standard stereo to multichannel surround sound
- HDMI combines video and multichannel audio into a single cable, eliminating the cost, complexity, and confusion of multiple cables currently used in A/V systems
- HDMI supports communication between the video source (such as a DVD player) and the DTV, enabling new functionality

Software and Troubleshooting

Chipsets

All laptops or notebook communicate with the CPU through the chipset. This laptop is shipped with the Intel Sky Lake or Kaby Lake chipset.

Identifying the chipset in Device Manager on Windows 10

1. Click **All Settings** ⚙ on the Windows 10 Charms Bar.
2. From the **Control Panel**, select **Device Manager**.
3. Expand **System Devices** and search for the chipset.
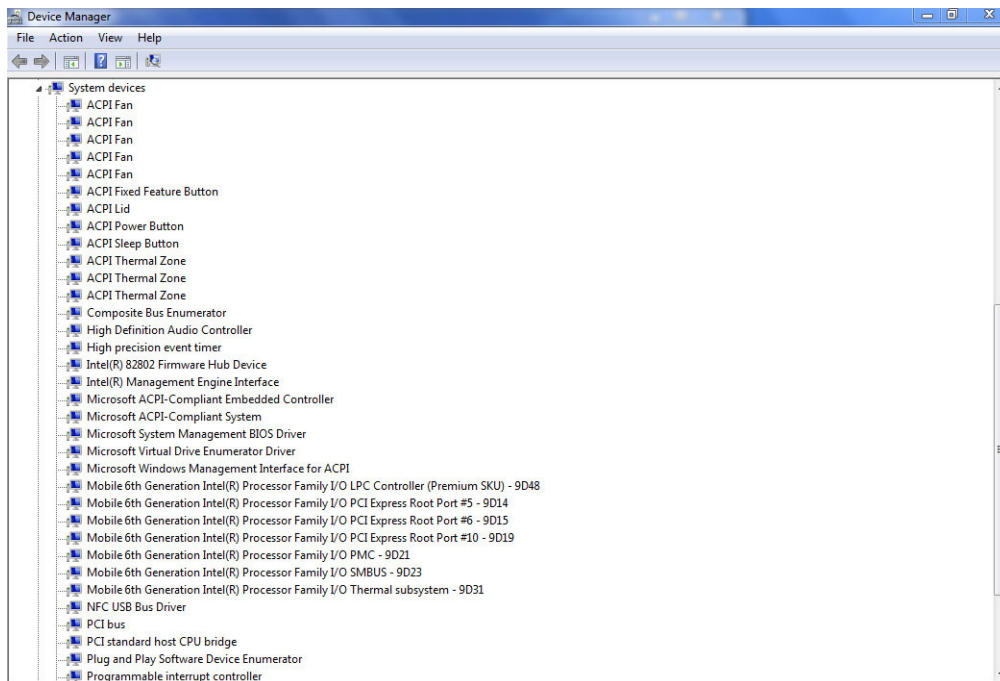
Identifying chipset in Device Manager on Windows 7

1. Click **Start → Control Panel → Device Manager**.
2. Expand **System Devices** and search for the chipset.
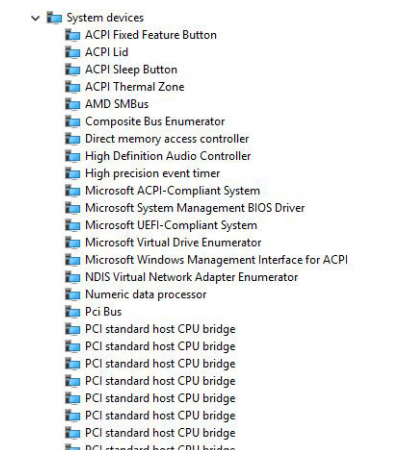
Intel chipset drivers

Verify if the Intel chipset drivers are already installed in the laptop.

Table 20. Intel chipset drivers

Before installation	After installation
Other devices 　PCI Data Acquisition and Signal Processing Controller 　PCI Device 　PCI Memory Controller 　PCI Simple Communications Controller 　SM Bus Controller 　Unknown device System devices 　ACPI Fan 　ACPI Fan 　ACPI Fan 　ACPI Fan 　ACPI Fan 　ACPI Fixed Feature Button 　ACPI Power Button 　ACPI Processor Aggregator 　ACPI Thermal Zone 　ACPI Thermal Zone 　Composite Bus Enumerator 　High Definition Audio Controller 　High precision event timer 　Intel(R) Power Engine Plug-in 　Legacy device 　Microsoft ACPI-Compliant Embedded Controller 　Microsoft ACPI-Compliant System 　Microsoft System Management BIOS Driver 　Microsoft UEFI-Compliant System 　Microsoft Virtual Drive Enumerator 　Microsoft Windows Management Interface for ACPI 　Microsoft Windows Management Interface for ACPI 　NDIS Virtual Network Adapter Enumerator 　Numeric data processor 　PCI Express Root Complex 　PCI Express Root Port 　PCI Express Root Port 　PCI Express Root Port 　PCI standard host CPU bridge 　PCI standard ISA bridge 　Plug and Play Software Device Enumerator 　Programmable interrupt controller 　Remote Desktop Device Redirector Bus 　System CMOS/real time clock 　System timer 　UMBus Root Bus Enumerator	System devices 　ACPI Fan 　ACPI Fan 　ACPI Fan 　ACPI Fan 　ACPI Fan 　ACPI Fixed Feature Button 　ACPI Lid 　ACPI Power Button 　ACPI Sleep Button 　ACPI Thermal Zone 　ACPI Thermal Zone 　ACPI Thermal Zone 　Composite Bus Enumerator 　High Definition Audio Controller 　High precision event timer 　Intel(R) 82802 Firmware Hub Device 　Intel(R) Management Engine Interface 　Microsoft ACPI-Compliant Embedded Controller 　Microsoft ACPI-Compliant System 　Microsoft System Management BIOS Driver 　Microsoft Virtual Drive Enumerator Driver 　Microsoft Windows Management Interface for ACPI 　Mobile 6th Generation Intel(R) Processor Family I/O LPC Controller (Premium SKU) - 9D48 　Mobile 6th Generation Intel(R) Processor Family I/O PCI Express Root Port #5 - 9D14 　Mobile 6th Generation Intel(R) Processor Family I/O PCI Express Root Port #6 - 9D15 　Mobile 6th Generation Intel(R) Processor Family I/O PCI Express Root Port #10 - 9D19 　Mobile 6th Generation Intel(R) Processor Family I/O PMC - 9D21 　Mobile 6th Generation Intel(R) Processor Family I/O SMBUS - 9D23 　Mobile 6th Generation Intel(R) Processor Family I/O Thermal subsystem - 9D31 　NFC USB Bus Driver 　PCI bus 　PCI standard host CPU bridge 　Plug and Play Software Device Enumerator 　Programmable interrupt controller

Downloading the chipset driver

1. Turn on the computer.
2. Go to **Dell.com/support**.
3. Click **Product Support**, enter the Service Tag of your computer, and then click **Submit**.

   (i) **NOTE:** If you do not have the Service Tag, use the autodetect feature or manually browse for your computer model.

4. Click **Drivers and Downloads**.
5. Select the operating system installed in your computer.
6. Scroll down the page, expand **Chipset**, and select your chipset driver.
7. Click **Download File** to download the latest version of the chipset driver for your computer.
8. After the download is complete, navigate to the folder where you saved the driver file.
9. Double-click the chipset driver file icon and follow the instructions on the screen.

Processor

Identifying processors in Windows 10

1. Tap **Search the Web and Windows**.
2. Type `Device Manager`.
3. Tap **Processor**.
   The basic information of the processor is displayed.

Identifying processors in Windows 7

1. Click **Start** > **Control Panel** > **Device Manager**.
2. Select **Processor**.

Processors
 - AMD A6-7310 APU with AMD Radeon R4 Graphics
 - AMD A6-7310 APU with AMD Radeon R4 Graphics
 - AMD A6-7310 APU with AMD Radeon R4 Graphics
 - AMD A6-7310 APU with AMD Radeon R4 Graphics
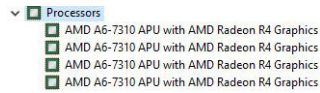
The basic information of the processor is displayed.

Verifying the processor usage in Task Manager

1. Press and hold the taskbar.
2. Select **Start Task Manager**.
   The **Windows Task Manager** window is displayed.
3. Click the **Performance** tab in the **Windows Task Manager** window. The processor performance details are displayed.
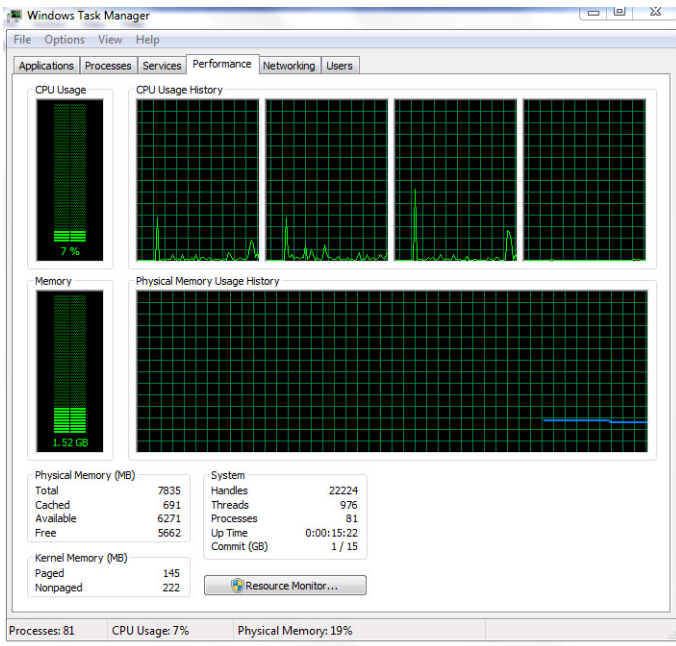
Verifying the processor usage in Resource Monitor

1. Press and hold the taskbar.
2. Select **Start Task Manager**.
   The **Windows Task Manager** window is displayed.
3. Click the **Performance** tab in the **Windows Task Manager** window.
   The processor performance details are displayed.
4. Click **Open Resource Monitor**.
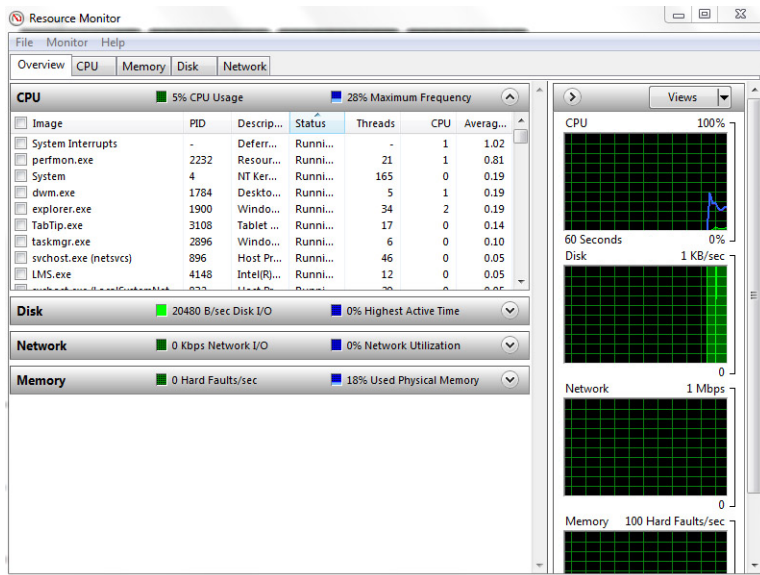
Verifying system memory

Windows 10

1. Tap the **Windows** button and select **All Settings** ⚙ > **System** .
2. Under **System**, tap **About**.

Windows 10

1. From your desktop, start the **Charms Bar**.
2. Select **Control Panel** and then select **System**.

Windows 7

- Click **Start** → **Control Panel** → **System**.

Verifying system memory in system setup BIOS

1. Turn on or restart your system.
2. Perform the following actions after the Dell logo is displayed
   - With keyboard — Tap F2 until the Entering BIOS setup message appears. To enter the Boot selection menu, tap F12.
3. On the left pane, select **Settings** > **General** > **System Information**,
   The memory information is displayed on the right pane.

Testing memory using ePSA

1. Turn on or restart your system.
2. Perform one of the following actions after the Dell logo is displayed:
   - With keyboard press **F12**.
   - The system displays one time boot menu and uses up and down arrow key to go to diagnostics and press enter to launch ePSA.
   The Pre Boot System Assessment (PSA) starts on your system.

> ⓘ **NOTE:** If you wait too long and the operating system logo be displayed, continue to wait until you see the desktop. Turn off the laptop and try again.

> ⓘ **NOTE:** ePSA can alternatively be launched by pressing and holding **Fn**+ **Press Power button**.

Display

Identifying the display adapter

1. Start the **Search Charm** and select **Settings**.
2. Type `Device Manager` in the search box and tap **Device Manager** from the left pane.
3. Expand **Display adapters**.
   The display adapters are displayed.
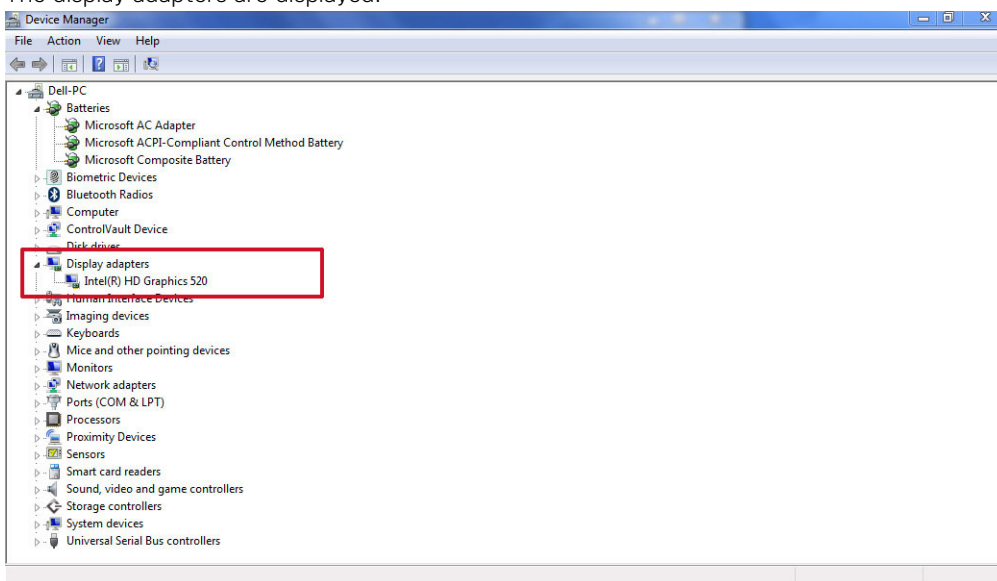
Identifying the display adapter

1. On the taskbar, click or tap the search box, and then type `Device Manger`.
2. Click or tap **Device Manager**.
   The **Device Manager** window is displayed.
3. Expand **Display adapters**.

Figure 7. Display adapters

Downloading drivers

1. Turn on the laptop.
2. Go to **Dell.com/support**.
3. Click **Product Support**, enter the Service Tag of your laptop, and then click **Submit**.

   > ⓘ **NOTE:** If you do not have the Service Tag, use the auto detect feature or manually browse for your laptop model.

4. Click **Drivers and Downloads**.
5. Select the operating system installed on your laptop.
6. Scroll down the page and select the driver to install.
7. Click **Download File** to download the driver for your laptop.

8. After the download is complete, navigate to the folder where you saved the driver file.
9. Double-click the driver file icon and follow the instructions on the screen.

Adjusting brightness in Windows 10

To enable or disable automatic screen brightness adjustment:
1. Swipe-in from the right edge of the display to access the Action Center.
2. Tap or click **All Settings** ⚙ > **System** > **Display**.
3. Use the **Adjust my screen brightness automatically** slider to enable or disable automatic-brightness adjustment.

   ⓘ **NOTE:** You can also use the **Brightness level** slider to adjust the brightness manually.

Adjusting brightness in Windows 7

To enable or disable automatic screen brightness adjustment:
1. Click **Start → Control Panel → Display.**
2. Use the **Adjust brightness** slider to enable or disable automatic-brightness adjustment.

   ⓘ **NOTE:** You can also use the **Brightness level** slider to adjust the brightness manually.

Changing the screen resolution

1. Press and hold the desktop screen and select **Display Settings**.
2. Tap or click **Advanced display settings**.
3. Select the required resolution from the drop-down list and tap **Apply**.
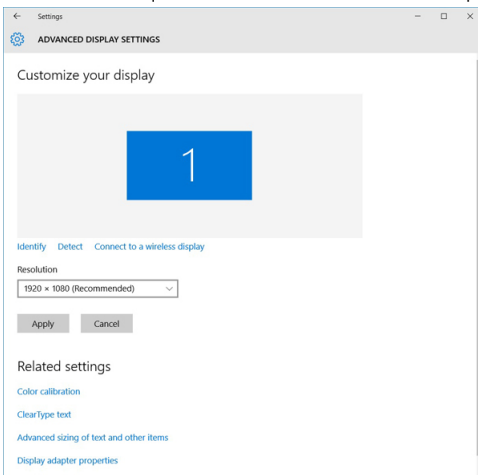
Connecting to external display devices

Follow these steps to connect your laptop to an external display device:
1. Ensure that the external display device is turned on and plug the external display device cable into a video port on your laptop.
2. Press the Windows logo+P key.
3. Select one of the following modes:
   ● PC screen only
   ● Duplicate
   ● Extend
   ● Second Screen only

> (i) **NOTE:** For more information, see the document that shipped with your display device.

Changing the display settings in Intel HD Graphics Control Panel

1. Right-click your desktop and select **Graphics Properties** to launch the **Intel HD Graphics Control Panel**.
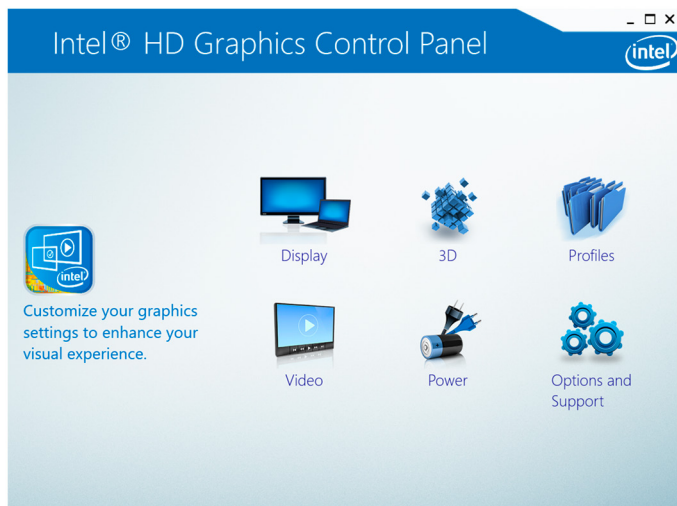
2. Click **Display**.
3. Change the display settings as required.

Using touch screen in Windows 8/ Windows 10

Follow these steps to enable or disable the touch screen:

1. Go to the Charms Bar and tap **All Settings** ⚙.
2. Tap **Control Panel**.
3. Tap **Pen and Input Devices** in the **Control Panel**.
4. Tap the **Touch** tab.
5. Select **Use your finger as an input device** to enable the touch screen. Clear the box to disable the touch screen.

Touchscreen Troubleshooting

If the touchscreen is not able to access items along the edges of the LCD, it may need to be calibrated. To calibrate the touchscreen, complete the following steps:

Touchscreen Calibration

Start > Control Panel > Tablet PC Settings > choose Calibrate...You can choose to calibrate Pen input or Touch input.

Perform the point calibrations that appear on the screen to correct the linearity problems.

Touchscreen Sensitivity

The touch screen may start to lose its sensitivity due to foreign particles (such as sticky notes) that are blocking the touch sensors. To remove these particles:

* Turn off the computer.
* Disconnect the AC adapter cable from the wall outlet.

> (i) **NOTE:** Do not use water or a cleaning liquid to wipe the touch screen.

- Use a clean, lint-free cloth (you may spray mild, non-abrasive cleaner or water on the cloth if needed, but not on the screen) and wipe the surface and sides of the touch screen to remove any dirt or fingerprints.

Application Promise

Consistent experience across form factors is what's necessary - a user can download any application from the Windows Store and it runs great on their machine. There is no application that runs great on one device but not on another. This means developers can target all Windows 8 and this version of Windows touch devices without worrying about the quality of touch devices depending on the type of form factor. For example, all Windows 8 touch devices require supporting a minimum of five simultaneous touches. All touch points require meeting requirements of 25 ms initial touch-down hardware latency and 15 ms subsequent contacts hardware latency. Game developers can design features based on fast and responsive five simultaneous touch points support across all Windows 8 touch devices.

Cleaning the display

1. Check for any smudges or areas that must be cleaned.
2. Use a microfiber cloth to remove any obvious dust and gently brush off any dust particles.
3. Proper cleaning kits should be used to clean and keep your display in a crisp clear pristine condition.

   (i) **NOTE:** Never spray any cleaning solutions directly on the screen; spray it to the cleaning cloth.

4. Gently wipe the screen in a circular motion. Do not press hard on the cloth.

   (i) **NOTE:** Do not press hard or touch the screen with your fingers or you may leave oily prints and smears.

   (i) **NOTE:** Do not leave any liquid on the screen.

5. Remove all excess moisture as it may damage your screen.
6. Let the display dry thoroughly before you turn it on.
7. For stains that are hard to remove, repeat this procedure till the display is clean.

Troubleshooting Touchpad

Most touch pad issues are erratic movement or no movement at all. Since erratic movement is the more common problem, it is covered first.

Erratic Pointer Movement

Here are some easy steps to take to determine the problem with a touch pad demonstrating erratic pointer movement:

1. Get the latest driver from Dell support site - Most problems can be corrected with a simple driver download. This should always be one of the first steps when diagnosing any touch pad problem.
2. Check for hand and finger placement - The most common cause of random pointer movement is that the touch pad senses a finger or part of the hand near the surface of the device.

   - Have the customer attempt to use the touch pad normally but to pay attention to the location of his or her hands and fingers. Are any straying too close to the touch pad?
   - Adjust the Touch Sensitivity and Touch and check settings in the Touch Pad Settings section of the Dell Touchpad Properties.

3. Try an external mouse - Does this problem happen with an external mouse attached?

   - The Device Select section of the Dell Touchpad Properties has options to enable or disable the touch pad or external mouse. Try several combinations of these settings.
   - If the problems only occur when the touch pad is enabled and do not occur any time a mouse or other external device is used, then the issue is related to the touch pad.

4. Check for mechanical problems - If the problem cannot be corrected by adjusting the settings mentioned above and only occurs with the touch pad enabled and then this could indicate a mechanical problem.

   - Press down on the palm rest on first the left side of the touch pad and then the right. See if the cursor starts moving on its own.

- Run ePSA Diagnostics and try to recreate the problems there. If either of these situations occurs, replace the palm rest.

No Pointer Movement

No pointer movement from the touch pad (or track stick, if available) usually is the result of one of two things: The touch pad has been disabled in the driver interface, or the touch pad cable is damaged or disconnected. Follow the steps below to determine the problem.

1. Connect an external mouse - In either situation, an external mouse should still function. If it does not, try booting into Safe Mode and testing both devices again.
2. Enable the touch pad in the driver settings - Using the external mouse (or key strokes if no mouse is available), go into the Dell Touchpad Properties. Go to the Device Select section and enable the touch pad. If already enabled, get the latest driver from Dell support site.
3. Test the device in Dell ePSA Diagnostics - To eliminate a potential software problem, run the Dell ePSA Diagnostics and test the device here.
4. Check for mechanical problems - As a last resort, press down on the palm rest where the touch pad connector is located on the system board. If the pointer reacts in some way, then the cable may just need to be reseated. Otherwise, replace the palm rest.

Troubleshooting Your Pen

The stylus is the first component to be investigated in the event of a suspected problem with the digitizer.

Ensure that you perform the following steps:
1. Verify the pen tip is in good shape (free of chips, excessive wear, etc.).
2. Replace the pen tip with a new one or the one that is in good condition.
3. Verify that the touch capabilities are not affected.
4. Switch to touch mode and see if the problem still exists.
5. If no symptoms persist in touch mode, the pen tip is the most likely suspect.
6. If the problem does persist in touch mode, run diagnostics and take the necessary steps depending on the results.

Realtek HD audio drivers

Verify if the Realtek audio drivers are already installed in the computer.

Table 21. Realtek HD audio drivers

Before installation	After installation
Audio inputs and outputs Microphone (High Definition Audio Device) Speakers (High Definition Audio Device) Sound, video and game controllers High Definition Audio Device Intel(R) Display Audio	Sound, video and game controllers Bluetooth Hands-free Audio Intel(R) Display Audio Realtek High Definition Audio

Troubleshooting audio issues

This topics details the troubleshooting steps in resolving audio related issues specific to IDT92HD87 audio chip

No Audio

Determine if the problem is only on the internal or external speakers or both.
1. If the problem is external only, try reseating the speakers or headphones. Also try another set of speakers or headphones if available. Check the speaker connector for damage. If the problem does not happen with different speakers, then the problem is related to the external device. If it persists, then there is a problem with either the audio connector or the audio controller. Confirm this by running Dell Diagnostics.
2. If the problem is internal only, try shaking the unit and see if the sound returns or plays intermittently. If it does, then a connection for the speakers is loose and the unit needs service. If there is still no sound at all, then try deleting the hardware

profile (if possible) and recreating it. Test the speakers using Dell Diagnostics both internally and externally. If the problem only happens on the internal speakers, then the speakers and possibly the system board need to be replaced.

If there is no audio from either internal or external speakers, then check the following:

1. Adjust the volume controls. Some systems also have an external volume control in addition to the one in the Windows® operating system.
2. Check Device Manager and ensure the audio driver is installed correctly. Any problems indicated here can normally be resolved by reinstalling the audio driver from the ResourceDVD or from dell.com/support.
3. If the audio is installed correctly in Windows but there still is no sound, run Dell Diagnostics on the audio controller. If these fail or no sound is heard, then replace the system board. If audio does play during this test, then the problem is most likely software related.

Poor Sound Quality

1. Determine if the problem is related to a specific application or program. If so, the software may not be fully compatible with the audio controller on the system. Check the software manufacturer´s website for any updates.
2. Update to the latest BIOS and driver from dell.com/support
3. Some problems can be caused by issues with the DirectX® API. Try downloading the latest version from Microsoft.
4. See if the problem occurs on both internal and external speakers. If isolated to only one of the two, follow the troubleshooting mentioned above. Otherwise, run Dell Diagnostics to test the audio.
5. If the problem fails during the audio test, this is a hardware problem and the system needs service. If it does not, then a software problem exists.

Sound from Only One Channel

1. The majority of the time, this problem happens only on external speakers. Reseating the speaker connection usually corrects the problem.
2. Check the volume control in Windows and make sure the balance slider is not set all the way to one side.
3. If this problem is happening only on internal speakers, try shaking the unit to see if sound comes back or if it comes and goes intermittently. If either of these occurs, a loose speaker connection most likely is the problem and the system needs service.
4. If this issue is happening only on external speakers and the previous steps did not help, then examine the audio connector for damage. Test the system with Dell Diagnostics. If the problem persists there, then the audio connector needs to be replaced.

Camera features

This laptop comes with front-facing camera with the image resolution of 1280 x 720 (maximum).

(i) **NOTE:** The camera is at the top center of the LCD.

Identifying the camera in Device Manager on Windows 10

1. In the **Search** box, type `device manager`, and tap to start it.
2. Under **Device Manager**, expand **Imaging devices**.
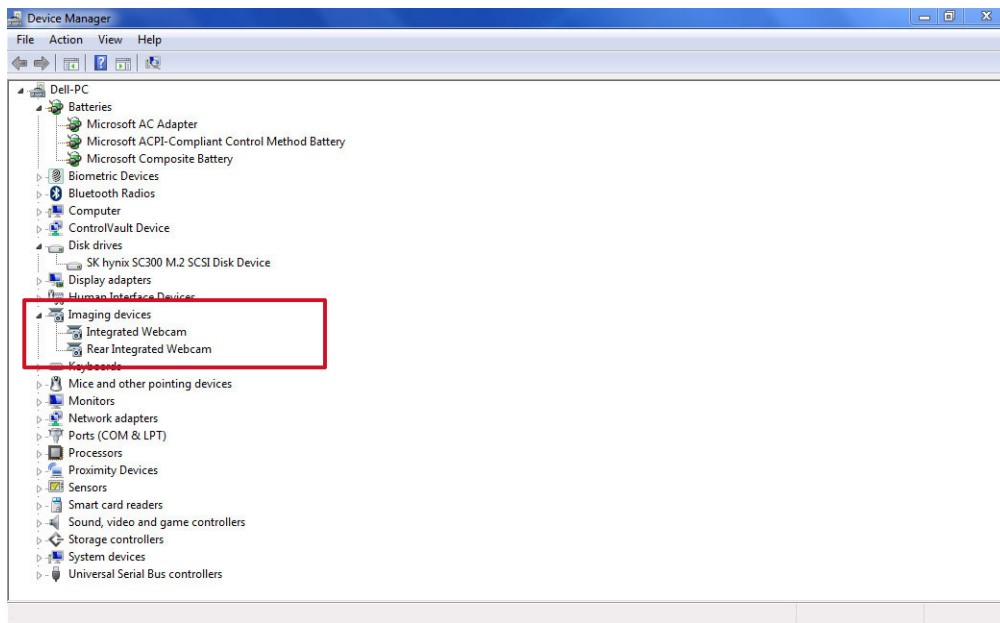
Identifying the camera in Device Manager on Windows 7

1. Click **Start** > **Control Panel** > **Device Manager**.
2. Expand **Imaging devices**.
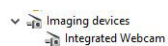
Starting the camera

To start the camera, open an application that uses the camera. For instance, if you tap the Skype software that is shipped with the laptop, the camera turns on. Similarly, if you are chatting on the internet and the application requests to access the webcam, the webcam turns on.

Starting the camera application

1. Tap or click the **Windows** button and select **All apps**.
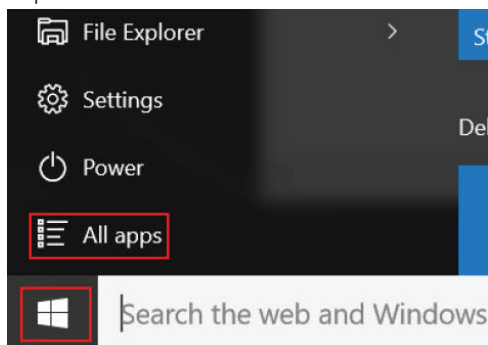
2. Select **Camera** from the apps list.
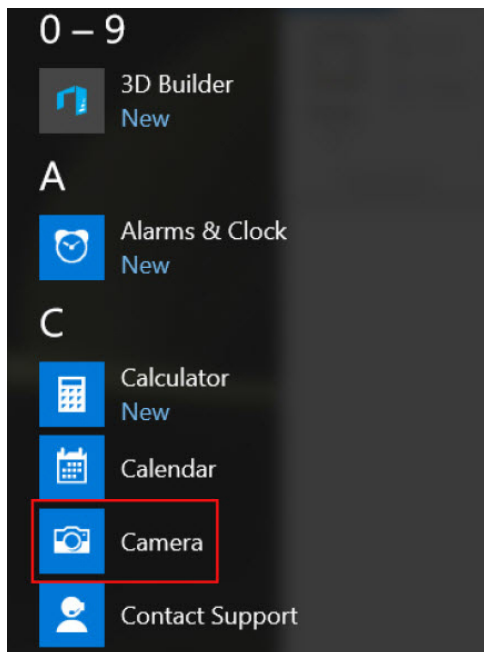
3. If the **Camera** App is not available in the apps list, search for it.
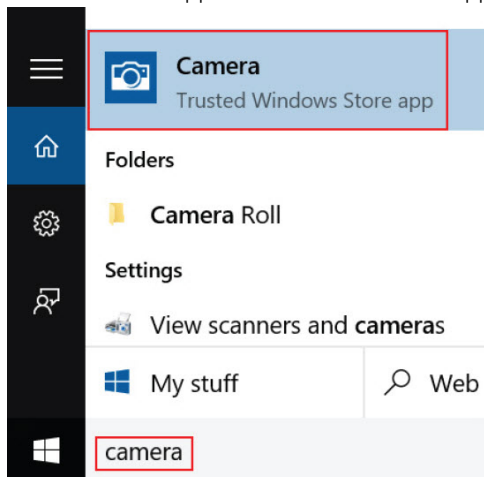
Hard drive options

This laptop supports M.2 SATA drives.

Identifying the hard drive in Windows 10

1. Tap or click **All Settings** ⚙ on the Windows 10 Charms Bar.
2. Tap or click **Control Panel**, select **Device Manager** , and expand **Disk drives**.

The hard drive is listed under **Disk drives**.
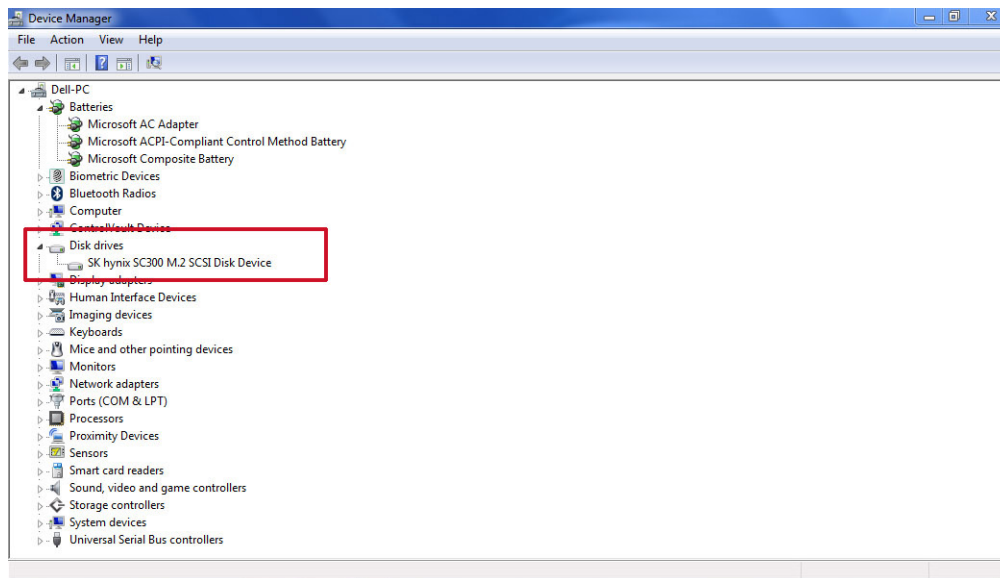
Identifying the hard drive in Windows 7

1. Click **Start** > **Control Panel** > **Device Manager**.
   The hard drive is listed under Disk drives.
2. Expand **Disk drives**.

Identifying the hard drive in the BIOS

1. Turn on or restart your system.
2. When the Dell logo appears, perform the following action to enter the BIOS setup program:
   - With keyboard — Tap F2 until the Entering BIOS setup message appears. To enter the Boot selection menu, tap F12.
   The hard drive is listed under the **System Information** under the **General** group.
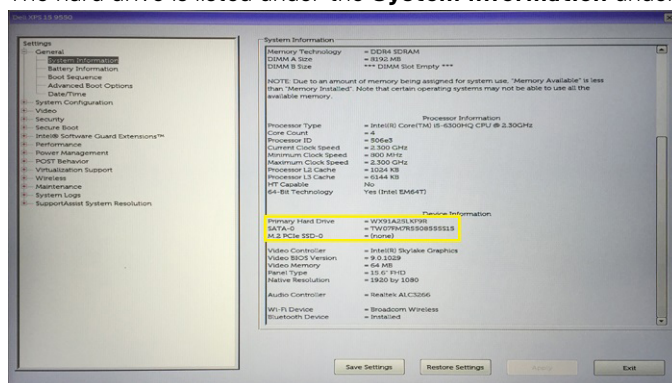
Dell Command Configure

Dell Command | Configure (Command | Configure) is a packaged software offering that provides configuration capability to business client platforms. This product consists of a Command Line Interface (CLI) and Graphical User Interface (GUI) to configure various BIOS features. You can use Command | Configure on Microsoft Windows Pre-installation Environment (Windows PE), Windows 7, Windows 8, and Windows 8.1, Windows 10 operating systems, and Red Hat Enterprise Linux environments.

What's new with Dell Command | Configure

The new features for the Dell Command | Configure includes:

- Dell Client Configuration Toolkit (CCTK) is re-branded as Dell Command | Configure (DCC).
- New User Interface.
- Support for Red Hat Enterprise Linux 7.0 Client version (64-bit) operating system.
- Support for x6 client platforms
- Support for Advanced System Management (ASM) 2.0 on Dell Precision™ Workstations for setting the non-critical upper threshold values for cooling probes.
- Support for additional arguments: **medium_high** and **medium_low** for configuring the fan speed using **--fanspeed** option.
- Support for the following BIOS options:
  - --backcamera.
  - --fnlock
  - --fnlockmode
  - --gpsradio
  - --keyboardbacklightonacpower
  - --rearusb
  - --sideusb
  - --unmanagednic

Platforms Supported

These are the business clients platforms supported:

- Latitude™
- OptiPlex™
- Dell Precision Workstation Mobile
- Dell Precision Workstation

ⓘ **NOTE:** Dell Command | Configure will not be pre-loaded for the customer upon purchase. Customers will be able to download the software from the Dell support website.

Command | Configure Graphical User Interface

The **Dell Command | Configure** Graphical User Interface (Command | Configure GUI) displays all Basic Input/Output System (BIOS) configurations supported by Command | Configure. Using the GUI, you can perform the following tasks:

- Create BIOS configuration for client systems
- Validate the BIOS configuration against the BIOS configuration of the host system
- Export the customized BIOS configurations as a configuration file (.ini/.cctk), Self-Contained Executable (SCE), shell script, or report

ⓘ **NOTE:** To apply the configuration using Command Line Interface (CLI), run the required file (**.ini , .cctk,** or **sce**).

Accessing Command | Configure From a Windows System

Click **Start > All Programs > Dell > Command | Configure > Command Configure Command Wizard**.
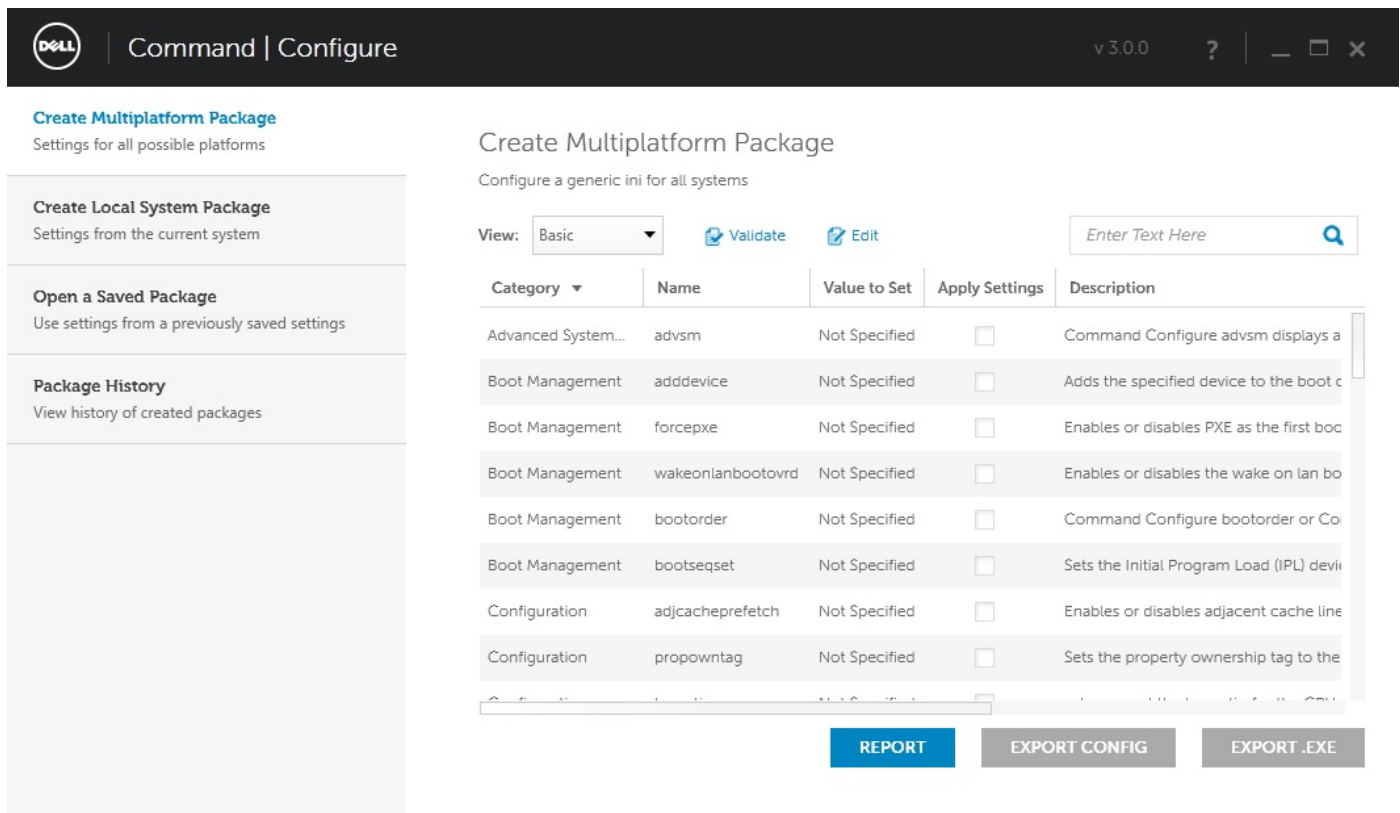
Accessing Command | Configure From a Linux System

Navigate to the **/opt/Dell/toolkit/bin** directory.

Files And Folders of Command | Configure

The following table displays the files and folders of Command | Configure on a Windows system.

Table 22. Files And Folders configuration

Files/Folders	Description
Command | Configure Command Prompt	Allows access to the Command | Configure command prompt.
Configuration Wizard	Allows access to the Command | Configure GUI.
Command | Configure WINPE	Allows access to the Windows PE scripts to create a bootable image. For more details, see the Dell Command | Configure Installation Guide.
Uninstall	Uninstalls Command | Configure.
User's Guide Online	Provides access to the Command | Configure online documentation.

Launching The Command | Configure GUI

(i) **NOTE:** The Command | Configure GUI is supported only on systems running the Windows operating system.

To launch the GUI, click **Start > All Programs > Dell > Command Configure > Configuration Wizard** or double-click the **Dell Configuration Wizard** on the desktop. The below screen appears:
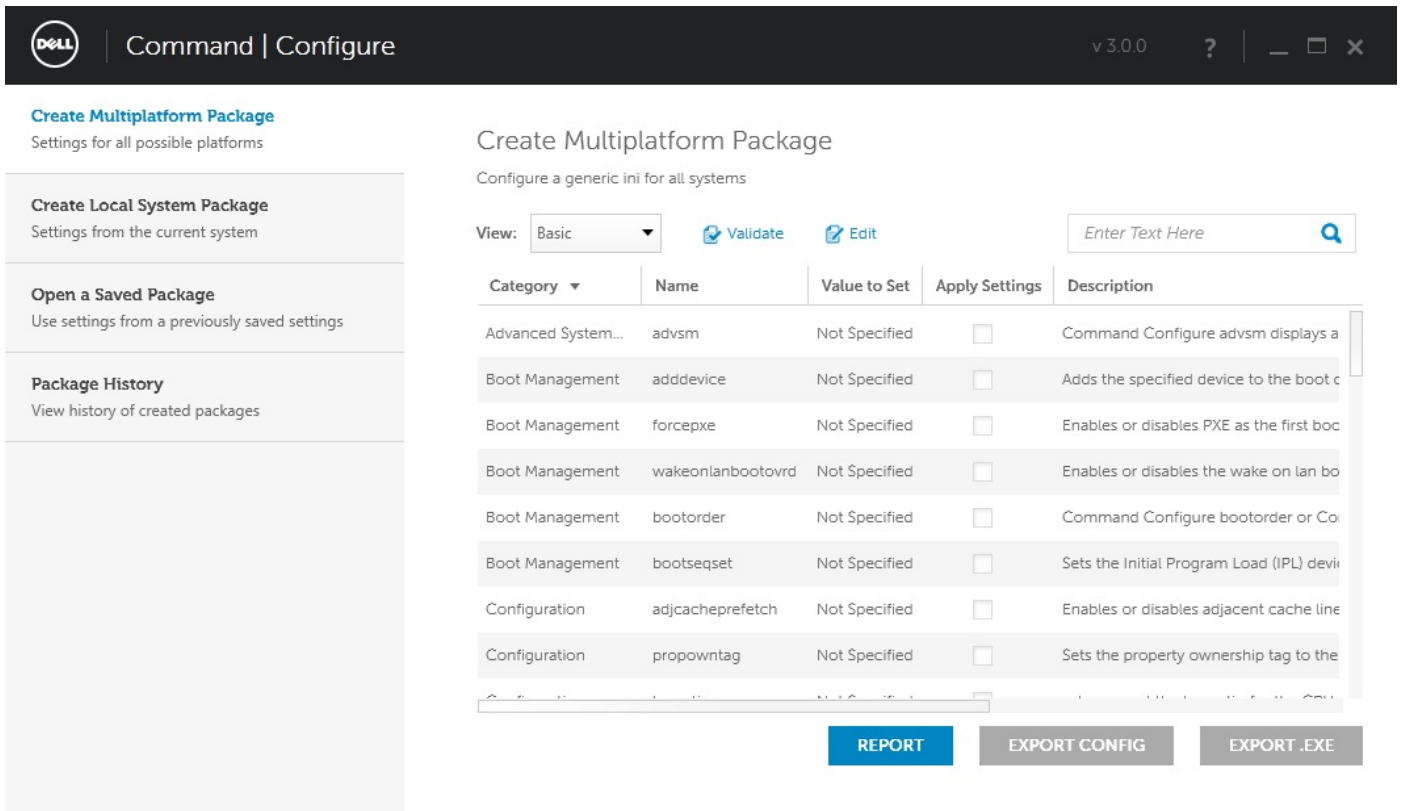
Command Line Interface

This chapter provides a general overview of the Command Line Interface (CLI) utility. It explains how to run the commands and the syntax details of the command line options used to configure BIOS settings for the client systems.

Running Command | Configure Commands

You can run the Command | Configure commands in two ways:

- Using Command Prompt
- Using Bootable Image

Command Prompt

To run Command | Configure commands:

1. Click Start → All Program → Dell → Command Configure → Command Configure Command Prompt.
2. Navigate to the x86 or x86_64 directory depending on the architecture of the operating system.
3. Run the Command | Configure commands.

Bootable Image

To run Command | Configure commands:

1. Copy Dell Command | Configure with the International Organization for Standardization (ISO) image to a Compact Disc (CD). For more information, see Dell Command | Configure Installation Guide.
2. Boot the system that you want to configure from the CD.
3. Navigate to the Command Configure\x86 or Command Configure\x86_64 directory.
4. Run the Command | Configure commands.

Intel HD Graphics drivers

Verify if the Intel HD Graphics drivers are already installed in the laptop.

Table 23. Intel HD Graphics drivers

Before installation	After installation

Display adapters
  Microsoft Basic Display Adapter
 	
Sound, video and game controllers
  High Definition Audio Device
  High Definition Audio Device
	Display adapters
	  Intel(R) HD Graphics 520

Removing and installing components

This section provides detailed information on how to remove or install the components from your computer.

Topics:

Safety instructions

Use the following safety guidelines to protect your computer from potential damage and to ensure your personal safety. Unless otherwise noted, each procedure included in this document assumes that the following conditions exist:

- You have read the safety information that shipped with your computer.
- A component can be replaced or, if purchased separately, installed by performing the removal procedure in reverse order.

⚠ **WARNING: Before working inside your computer, read the safety information that shipped with your computer. For additional safety best practices information, see the Regulatory Compliance Homepage**

⚠ **CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or**

telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

⚠ **CAUTION: To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface at the same time as touching a connector on the back of the computer.**

⚠ **CAUTION: Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a processor by its edges, not by its pins.**

⚠ **CAUTION: When you disconnect a cable, pull on its connector or on its pull-tab, not on the cable itself. Some cables have connectors with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before you disconnect the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, ensure that both connectors are correctly oriented and aligned.**

ⓘ **NOTE:** Disconnect all power sources before opening the computer cover or panels. After you finish working inside the computer, replace all covers, panels, and screws before connecting to the power source.

ⓘ **NOTE:** The color of your computer and certain components may appear differently than shown in this document.

Before working inside your computer

1. Ensure that your work surface is flat and clean to prevent the computer cover from being scratched.
2. Turn off your computer.
3. If the computer is connected to a docking device (docked), undock it.
4. Disconnect all network cables from the computer (if available).

   ⚠ **CAUTION: If your computer has an RJ45 port, disconnect the network cable by first unplugging the cable from your computer.**

5. Disconnect your computer and all attached devices from their electrical outlets.
6. Open the display.
7. Press and hold the power button for few seconds, to ground the system board.

   ⚠ **CAUTION: To guard against electrical shock unplug your computer from the electrical outlet before performing Step # 8.**

   ⚠ **CAUTION: To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface at the same time as touching a connector on the back of the computer.**

8. Remove any installed ExpressCards or Smart Cards from the appropriate slots.

Safety Precautions

Follow the safety precautions described in the following sections when you perform an installation or a disassembly/reassembly procedure:

- Turn off the system and all attached peripherals.
- Disconnect the system and all attached peripherals from AC power, and then remove the battery.
- Disconnect all network cables, telephone or telecommunications lines from the system.
- Use a wrist grounding strap and mat when working inside any computer system to avoid electrostatic discharge (ESD) damage.
- After removing a system component, carefully place the removed component on an anti-static mat.
- Wear shoes with non-conductive rubber soles to help reduce the risk of being shocked or seriously injured in an electrical accident.

Standby Power

Dell products with standby power must be completely unplugged before the case is opened. Systems that incorporate standby power are essentially powered while turned off. The internal power enables the system to be remotely turned on (wake on LAN), suspended into a sleep mode, and have other advanced power management features.

After you unplug a system and before you remove components, wait approximately 30 to 45 seconds to allow the charge to drain from the circuits.

Bonding

Bonding is a method for connecting two or more grounding conductors to the same electrical potential. This is done through the use of a Field Service ESD kit. When connecting a bonding wire, always ensure that it is connected to bare metal and never to a painted or non-metal surface. The wrist strap should be secure and in full contact with your skin, and be sure to always remove all jewelry such as watches, bracelets, or rings prior to bonding yourself and the equipment.
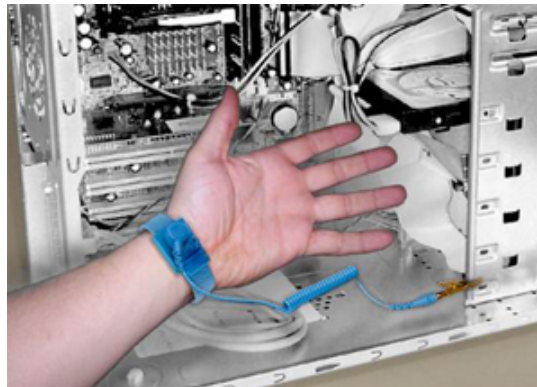
Figure 8. Bonding Properly

Electrostatic Discharge Protection

ESD is a major concern when you handle electronic components, especially sensitive components such as expansion cards, processors, memory DIMMs, and system boards. Very slight charges can damage circuits in ways that may not be obvious, such as intermittent problems or a shortened product life span. As the industry pushes for lower power requirements and increased density, ESD protection is an increasing concern.

Due to the increased density of semiconductors used in recent Dell products, the sensitivity to static damage is now higher than in earlier Dell products. For this reason some previously approved methods of handling parts are no longer applicable.

There are two recognized types of ESD damage: catastrophic and intermittent failures.

● **Catastrophic** —The damage causes an immediate and complete loss of device functionality. An example of catastrophic failure is a memory DIMM that has received a static shock and immediately generates a "No POST/No Video" symptom with a beep code emitted for missing or nonfunctional memory.

   ⓘ **NOTE:** Catastrophic failures represent approximately 20 percent of ESD-related failures.

● **Intermittent** —The DIMM receives a static shock, but the tracing is merely weakened and does not immediately produce outward symptoms related to the damage. The weakened trace may take weeks or months to melt, and in the meantime may cause degradation of memory integrity, intermittent memory errors, etc.

   ⓘ **NOTE:** Intermittent failures represent approximately 80 percent of ESD-related failures. The high rate of intermittent failures means that most of the time when damage occurs, it is not immediately recognizable.

The more difficult type of damage to recognize and troubleshoot is the intermittent (also called latent or "walking wounded") failure. The following image shows an example of intermittent damage to a memory DIMM trace. Although the damage is done, the symptoms may not become an issue or cause permanent failure symptoms for some time after the damage occurs.
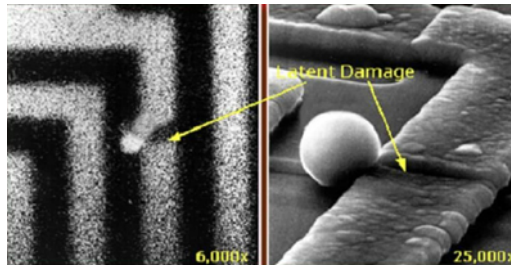
Figure 9. Intermittent (Latent) Damage to a Wiring Trace

Do the following to prevent ESD damage:

● Use a wired ESD wrist strap that is properly grounded.

   The use of wireless anti-static straps is no longer allowed; they do not provide adequate protection.

   Touching the chassis before handling parts does not ensure adequate ESD protection on parts with increased sensitivity to ESD damage.
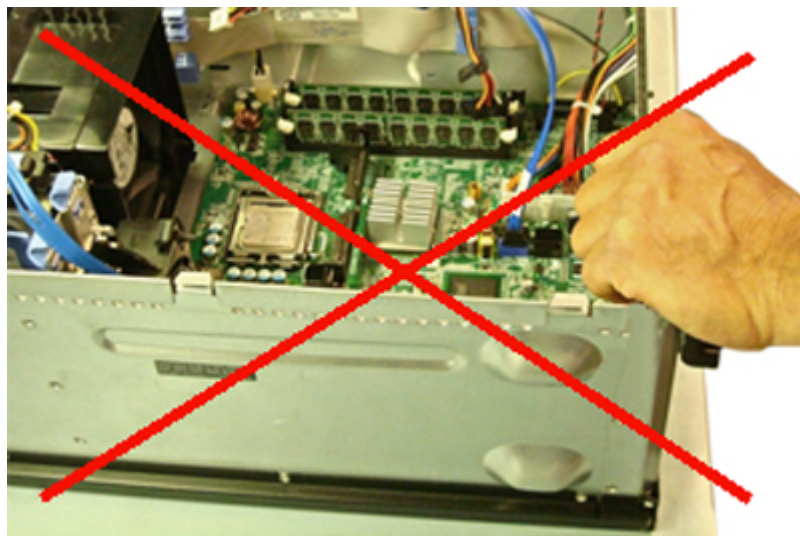
Figure 10. Chassis "Bare Metal" Grounding (Unacceptable)

● Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and workbench pads.
● When handling static-sensitive components, grasp them by the sides, not the top. Avoid touching pins and circuit boards.
● When unpacking a static-sensitive component from its shipping carton, do not remove the component from the anti-static packing material until you are ready to install the component. Before unwrapping the anti-static packaging, be sure to discharge static electricity from your body.
● Before transporting a static-sensitive component, place it in an anti-static container or packaging.

The ESD Field Service Kit

The unmonitored Field Service kit is the most commonly used. Each Field Service kit includes three main components: anti-static mat, wrist strap, and bonding wire.

Figure 11. ESD Field Service Kit

The anti-static mat is dissipative and should be used to safely place parts on during service procedures. When using an anti-static mat, your wrist strap should be snug and the bonding wire should be connected to the mat and to bare-metal on the system being worked on. Once deployed properly, service parts can be removed from the ESD bag and placed directly on the mat. Remember, the only safe place for ESD-sensitive items are in your hand, on the ESD mat, in the system, or inside a bag.

Figure 12. Anti-Static Mat

The wrist strap and bonding wire can be either directly connected between your wrist and bare metal on the hardware if the ESD mat is not required, or connected to the anti-static mat to protect hardware that is temporarily placed on the mat. The physical connection of the wrist strap and bonding wire between your skin, the ESD mat, and the hardware is known as bonding. Use only Field Service kits with a wrist strap, mat, and bonding wire. Never use wireless wrist straps.

Always be aware that the internal wires of a wrist strap are prone to damage from normal wear and tear, and must be checked regularly with a wrist strap tester in order to avoid accidental ESD hardware damage. It is recommended to test the wrist strap and bonding wire a minimum of once per week.

Table 24. Wrist Straps

Wrist Strap and Bonding Wire	Wireless ESD Strap (Unacceptable)

ESD Wrist Strap Tester

The wires inside of an ESD strap are prone to damage over time. When using an unmonitored kit, it is best practice to regularly test the strap prior to each service call, and at a minimum, test once per week. A wrist strap tester is the best method for doing this test. If you do not have your own wrist strap tester, check with your regional office to find out if they have one. To perform the test, plug the wrist-strap's bonding-wire into the tester while it is strapped to your wrist and push the button to test. A green LED is lit if the test is successful; a red LED is lit and an alarm sounds if the test fails.
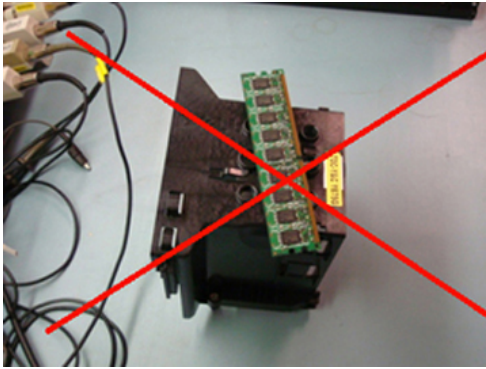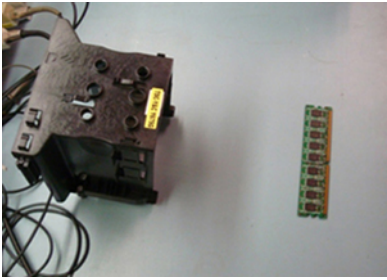
Figure 13. Wrist Strap Tester

Insulator Elements

It is critical to keep ESD sensitive devices, such as plastic heat sink casings, away from internal parts that are insulators and often highly charged.

Table 25. Placement of Insulator Elements

Unacceptable — DIMM lying on an insulator part (plastic heat sink shroud)	Acceptable — DIMM separated from the insulator part

Consider the Working Environment

Before deploying the ESD Field Service kit, assess the situation at the customer location. For example, deploying the kit for a server environment is different than for a desktop or portable environment. Servers are typically installed in a rack within a data center; desktops or portables are typically placed on office desks or cubicles.

Always look for a large open flat work area that is free of clutter and large enough to deploy the ESD kit with additional space to accommodate the type of system that is being repaired. The workspace should also be free of insulators that can cause an ESD event. On the work area, insulators such as Styrofoam and other plastics should always be moved at least 12 inches or 30 centimeters away from sensitive parts before physically handling any hardware components.

ESD Packaging

All ESD-sensitive devices must be shipped and received in static-safe packaging. Metal, static-shielded bags are preferred. However, you should always return the damaged part using the same ESD bag and packaging that the new part arrived in. The ESD bag should be folded over and taped shut and all the same foam packing material should be used in the original box that the new part arrived in.

ESD-sensitive devices should be removed from packaging only at an ESD-protected work surface, and parts should never be placed on top of the ESD bag because only the inside of the bag is shielded. Always place parts in your hand, on the ESD mat, in the system, or inside an anti-static bag.

Figure 14. ESD Packaging

Transporting Sensitive Components

When transporting ESD-sensitive components such as replacement parts or parts to be returned to Dell, it is critical to place these parts in anti-static bags for safe transport.

ESD Protection Summary

It is strongly suggested that all field service engineers use the traditional wired ESD grounding wrist strap and protective anti-static mat at all times when servicing Dell products. In addition, it is critical that engineers keep sensitive parts separate from all insulator parts while performing service and that they use anti-static bags for transporting sensitive components.

Lifting Equipment

(i) **NOTE:** Do not lift greater than 50 pounds. Always obtain assistance from another person or persons, or use a mechanical lifting device.

Adhere to the following guidelines when lifting equipment:

1. Get a firm balanced footing. Keep your feet apart for a stable base, and point your toes out.
2. Bend your knees. Do not bend at the waist.
3. Tighten stomach muscles. Abdominal muscles support your spine when you lift, offsetting the force of the load.
4. Lift with your legs, not your back.
5. Keep the load close. The closer it is to your spine, the less force it exerts on your back.
6. Keep your back upright, whether lifting or setting down the load. Do not add the weight of your body to the load. Avoid twisting your body and back.
7. Follow the same techniques in reverse to set the load down.

After working inside your computer

After you complete any replacement procedure, ensure that you connect external devices, cards, and cables before turning on your computer.

> ⚠️ **CAUTION: To avoid damage to the computer, use only the battery designed for this particular Dell computer. Do not use batteries designed for other Dell computers.**

1. Connect any external devices, such as a port replicator or media base, and replace any cards, such as an ExpressCard.
2. Connect any telephone or network cables to your computer.

> ⚠️ **CAUTION: To connect a network cable, first plug the cable into the network device and then plug it into the computer.**

3. Connect your computer and all attached devices to their electrical outlets.
4. Turn on your computer.

Recommended tools

The procedures in this document require the following tools:
- Phillips #0 screwdriver
- Phillips #1 screwdriver
- Plastic scribe
- 5.5 mm Socket wrench
- A pair of tweezers

> ⓘ **NOTE:** The #0 screw driver is for screws 0-1 and the #1 screw driver is for screws 2-4.

Stylus

Removing the stylus

1. Press the latch [1] and open the right I/O door [2].
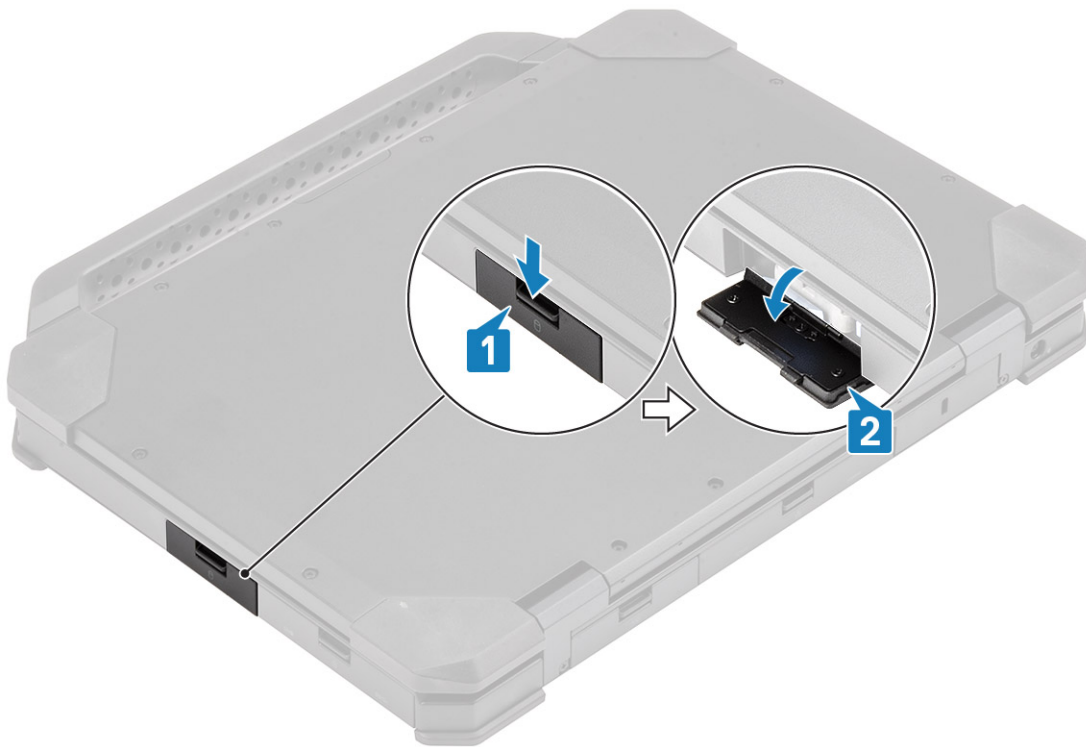
2. Withdraw the stylus out of the slot.
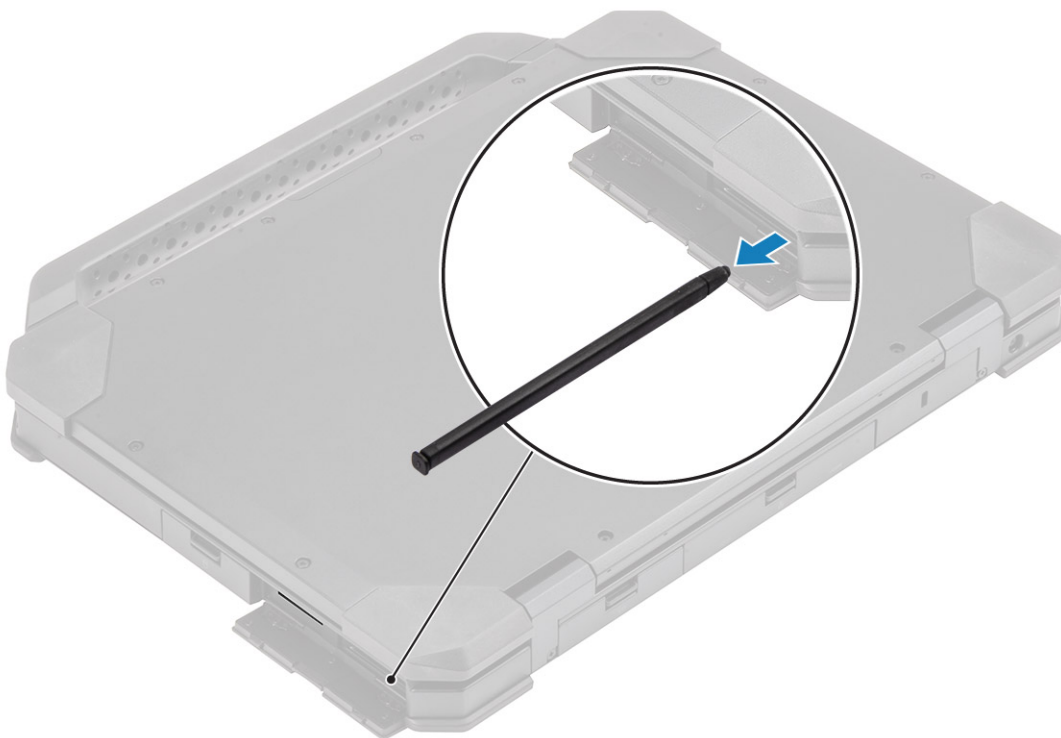
Installing the stylus

1. Insert the stylus in the slot.

2. Close the I/O door [1] and press the door until it latches [2].
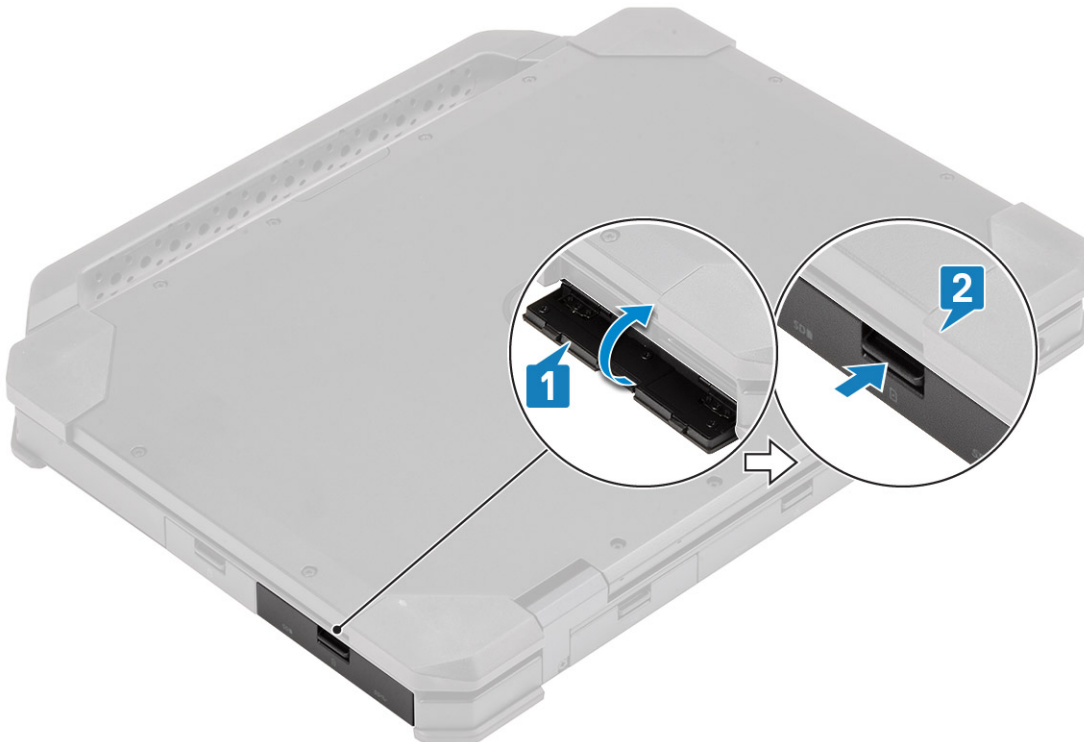
SIM card

Removing the SIM card

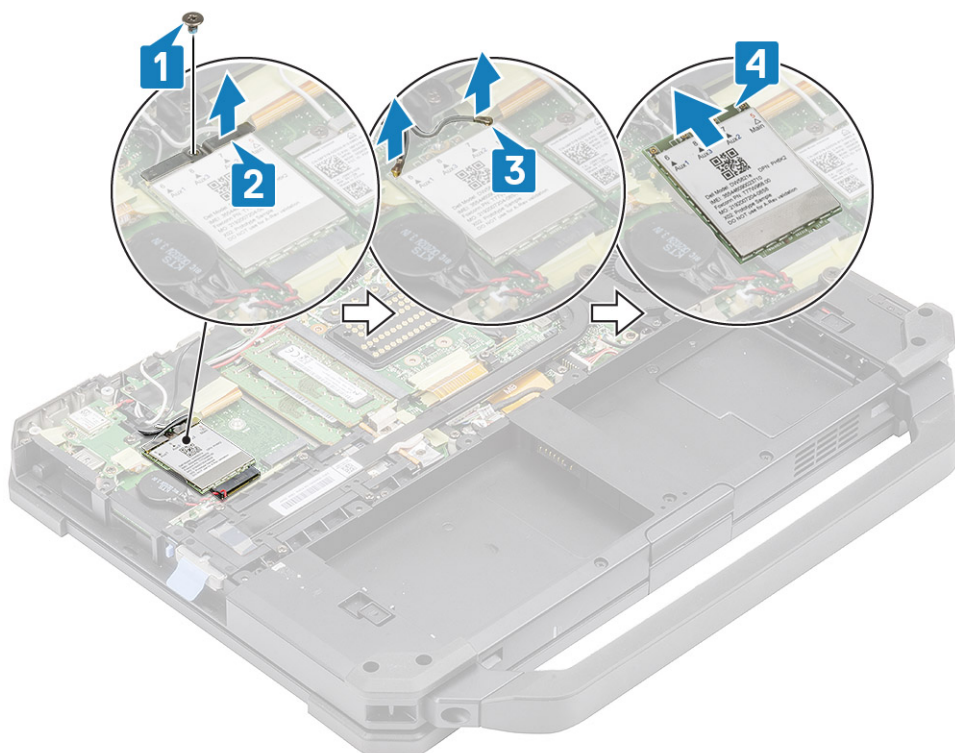1. Remove the SIM card out of the slot on the system board.

2. Close the right I/O door.
3. Follow the procedure in After working inside your computer.

Installing the SIM card

1. Follow the procedure in Before working inside your computer.
2. Open the right I/O door.
3. Insert the SIM card into the slot on the system board.

Memory card

Installing the memory card

1. Open the right I/O door.
2. Insert the memory card in the slot on the system board.

Removing the memory card

1. Remove the memory card from the slot on the system board.

2. Close the right I/O door.

Handle

Removing the Handle

ⓘ **NOTE:** The handle screw is part of the handle assembly and cannot be ordered separately.

1. Follow the procedure in Before working inside your computer.
2. ⚠ **CAUTION: The following epoxy screw locations require additional focus. These screws are difficult to remove and can be damaged during the removal process. To prevent damage to the screws and surrounding plastics, use the correct screwdriver for each screw type .**

   Remove the two epoxy M3.5*7 screws [1] that secures the handle to the computer.
3. Separate the handle from the computer [2].

Installing the Handle

ⓘ **NOTE:** The handle screw is part of the handle assembly and cannot be ordered separately.

1. Install the handle on the computer [1].
2. Tighten the two epoxy M3.5*7 screws [2] securing the handle to the computer.

3. Follow the procedure in After working inside your computer.

Latch Doors

Removing the latch doors

1. Follow the procedure in Before working inside your computer.
2. Open the I/O door.
3. Remove the screws [1] securing door hinges to the computer and lift the I/O door [2] away from the computer.
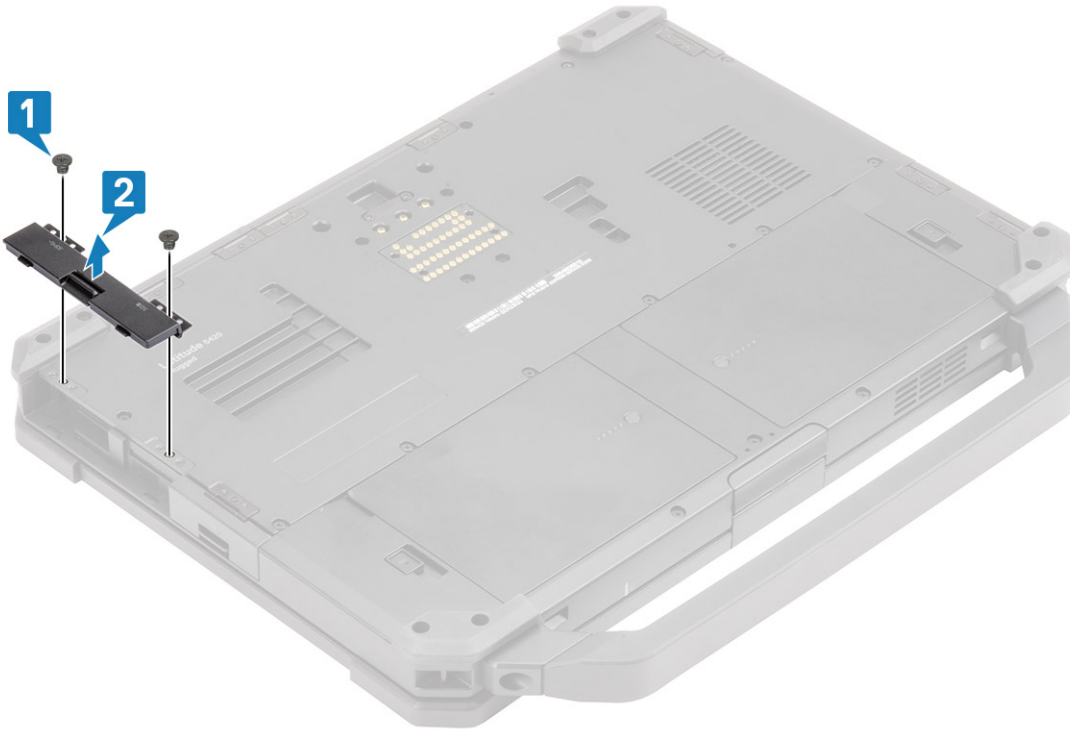
Installing the latch doors

1. Install the door on the computer [1].
2. Install the screws securing door hinges to the computer [2].
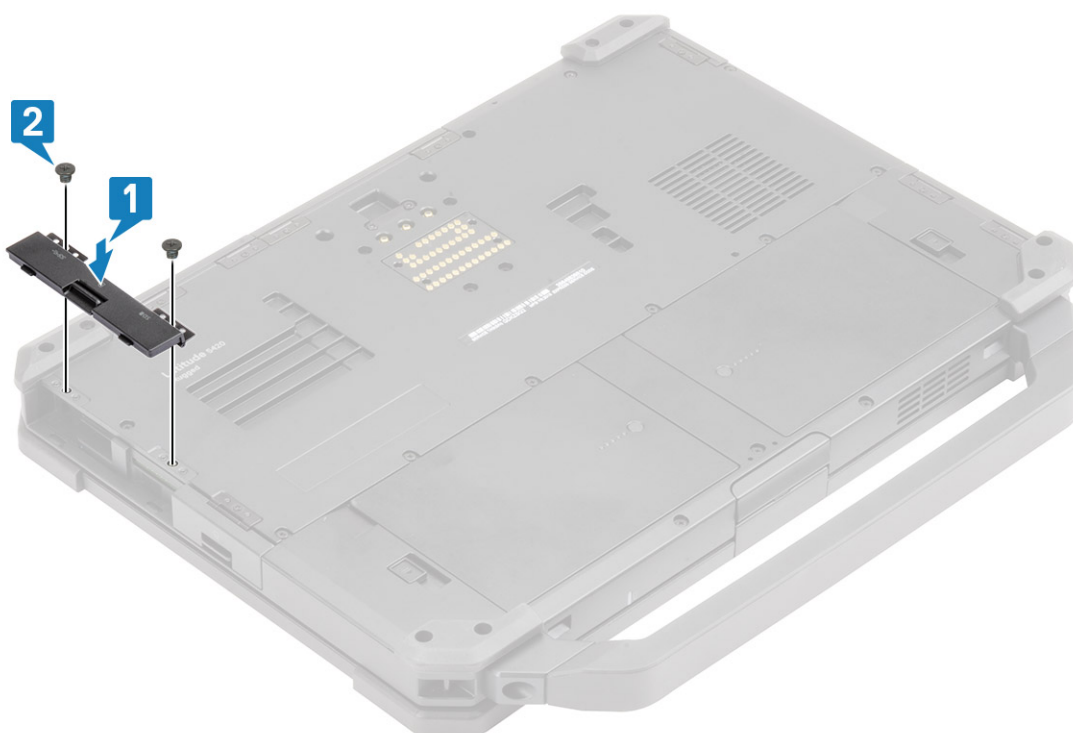
3. Lock the I/O door.
4. Follow the procedure in After working inside your computer.

(i) **NOTE:** Depending on its location each door may have one, two, or three screws.

Battery

Removing the Battery

1. (i) **NOTE:** This laptop can accommodate two hot-swap capable batteries(primary and optional), both the batteries follows the same installation and removal procedure.

   Follow the procedure in Before working inside your computer.
2. Unlock the battery [1] and slide the latch along the groove to disengage locking mechanism.
3. Pry on the recess point [2] and slide the battery forward [3] to remove it from the computer.
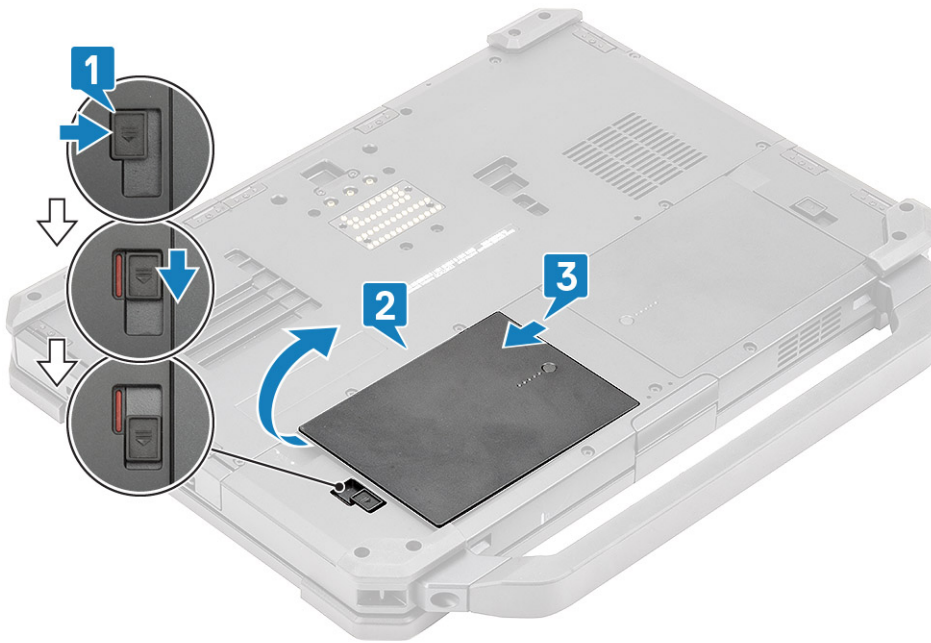
Installing the Batteries

1. Slide in the battery in battery bay to align the battery contacts[1], with one on the computer.
2. Press the edge of the battery [2] to engage the latch mechanism and lock the battery [3].
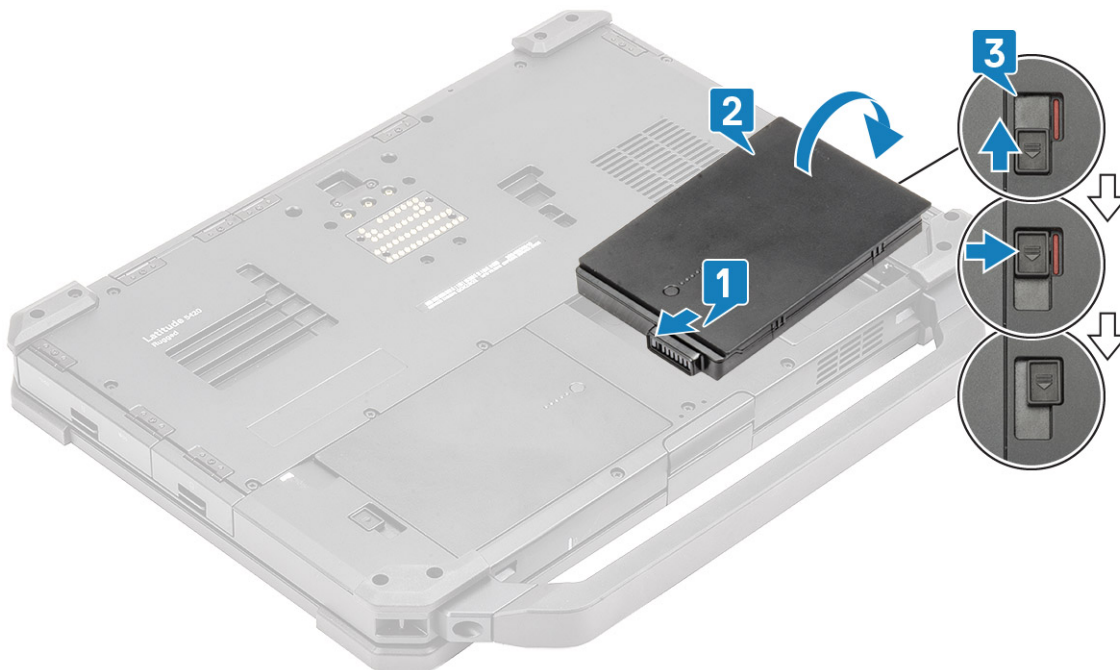
3. Follow the procedure in After working inside your computer.

   ⓘ **NOTE:** This laptop can accommodate two hot-swap capable batteries(primary and optional), both the batteries follows the same installation and removal procedure.

Primary SSD carrier

Removing the Primary SSD carrier

1. Follow the procedure in Before working inside your computer.

   ⚠️ **CAUTION: Attempt to retrieve the primary SSD carrier from an operational computer can cause operating system crash and potential data loss.**

2. Remove the: Batteries.
3. Press the latch [1] and open the right I/O door [2].
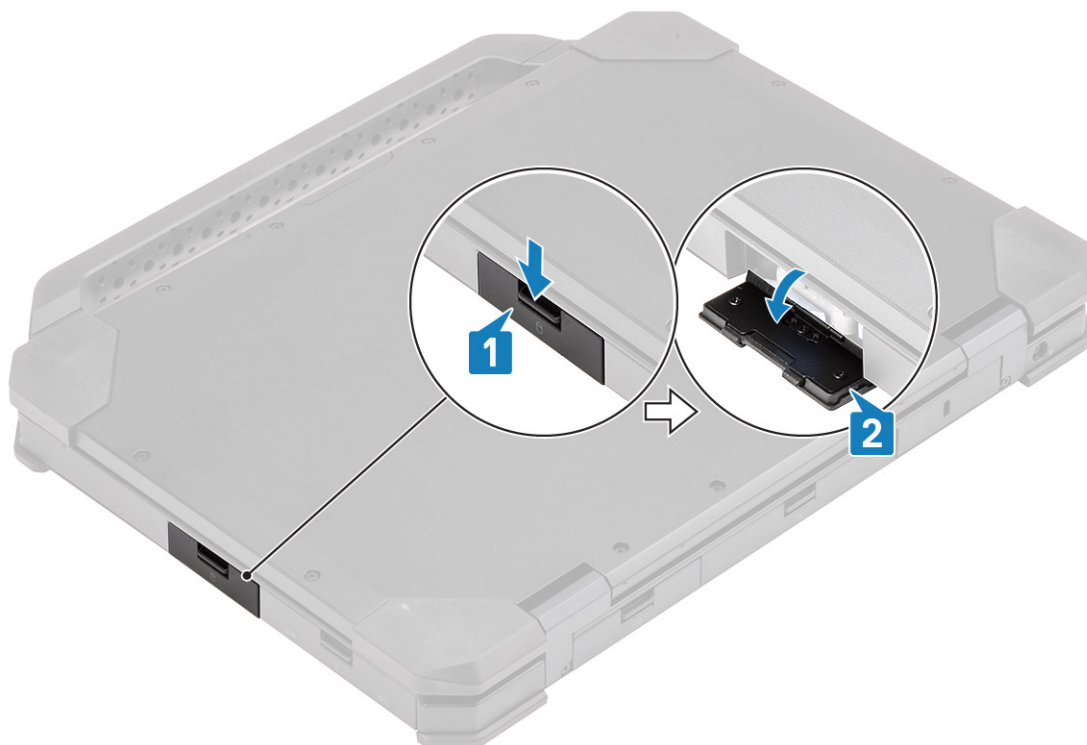
4. Release the SSD carrier by sliding the blue hard drive release latch [1] towards right.
5. Slide the SSD carrier out of the computer using the blue pull tab [2] out of the computer.
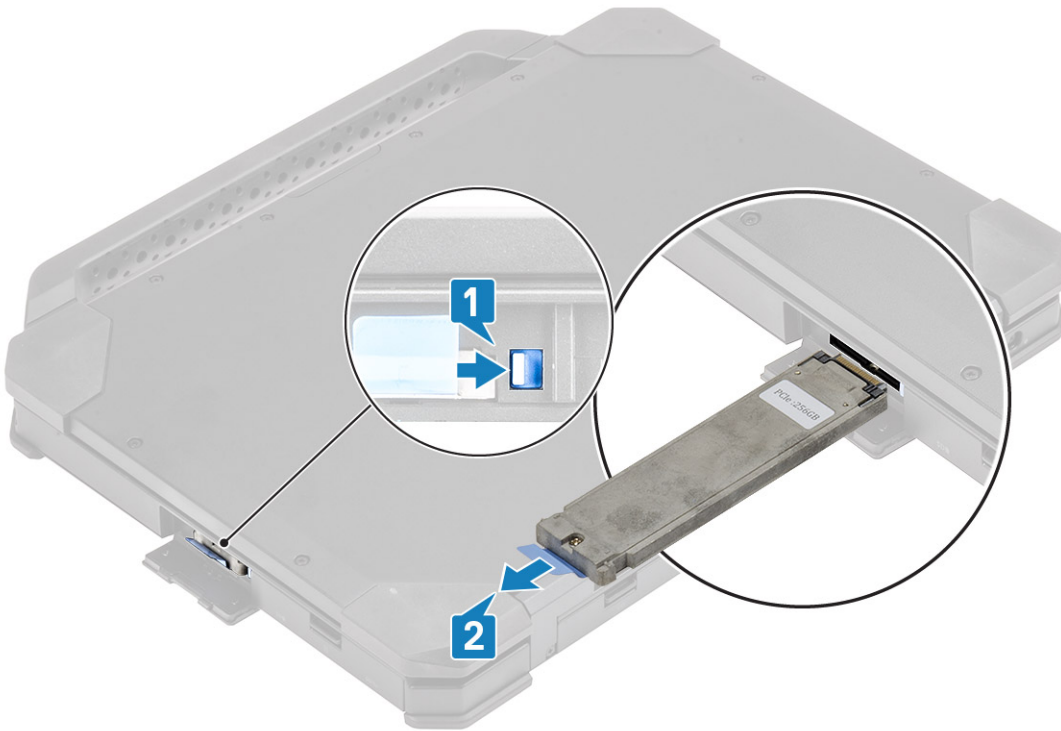
Installing the Primary SSD carrier

1. Insert the primary SSD carrier in to the computer.
2. Push the carrier into the slot until the blue tab clicks.
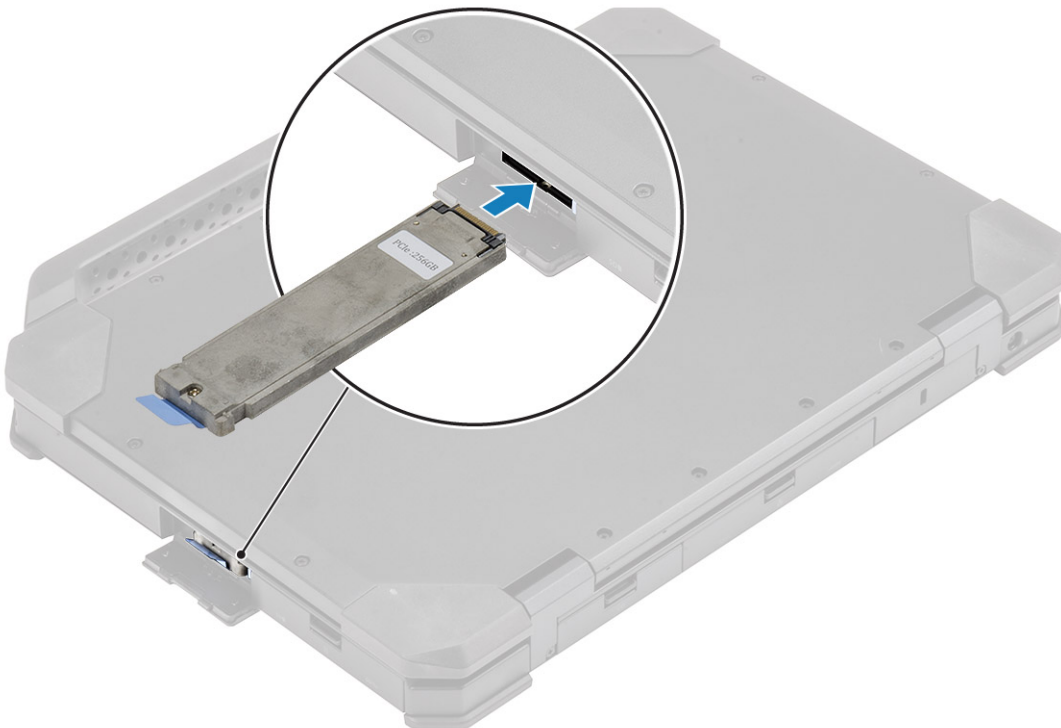
3. Close the right I/O door [1] and press the door until the latch [2] clicks up in locking position.
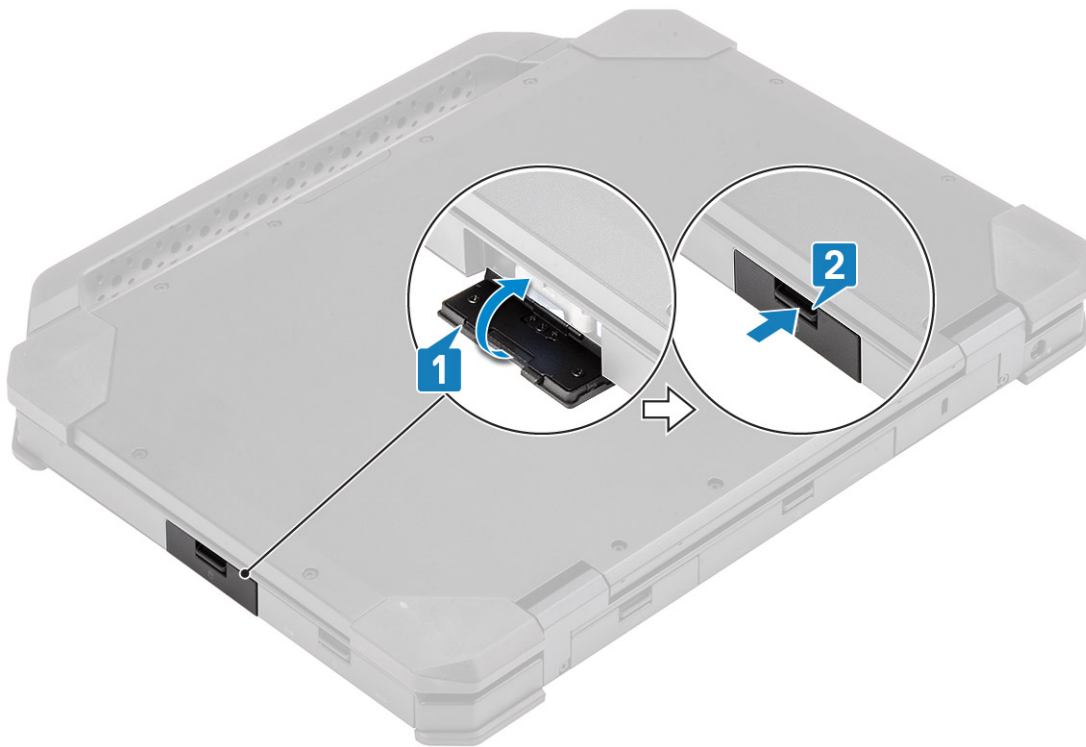
4. Install the: Batteries
5. Follow the procedure in After working inside your computer.

SSD

Removing the SSD from carrier

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries.
   b. SSD(Primary).
3. Remove the two 'M2*5' screws [1] and flip over the SSD carrier [2].
4. Remove the single 'M2*5' screw [3] and separate the cover from the SSD carrier [4].

5. Separate the SSD and interposer [1] from the SSD carrier tray.
6. Flip over the assembly [2] and disconnect the SSD from the interposer [3].
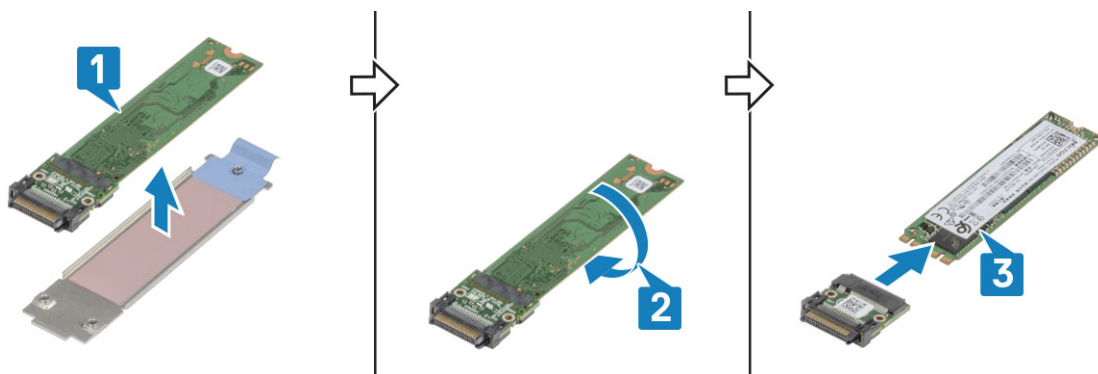
Installing the SSD in carrier

1. Connect the SSD to the interposer [1], flip over [2].
2. Install the SSD with interposer on the SSD carrier tray preassembled with new thermal pad [3].
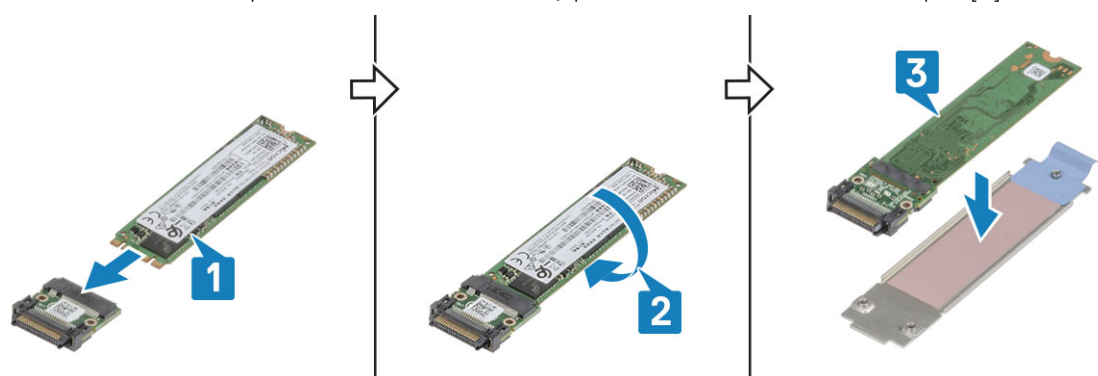
3. Install the cover [1] on the SSD carrier and install the single 'M2*5' screw [2].
4. Flip over the SSD carrier [3] and tighten the two 'M2*5' screws [4] securing the cover to the SSD carrier.
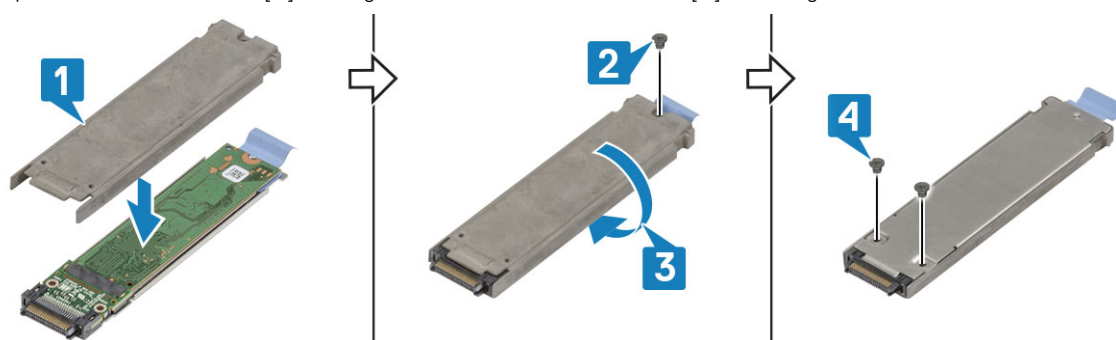
5. Install the:
   a. SSD(Primary).
   b. Batteries
6. Follow the procedure in After working inside your computer.

Bottom Chassis Cover

Removing the Bottom Chassis Cover

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries.

3. Open the left and rear I/O door[1] and loosen the two 'M2.5*6' screws [2] in the rear I/O space.
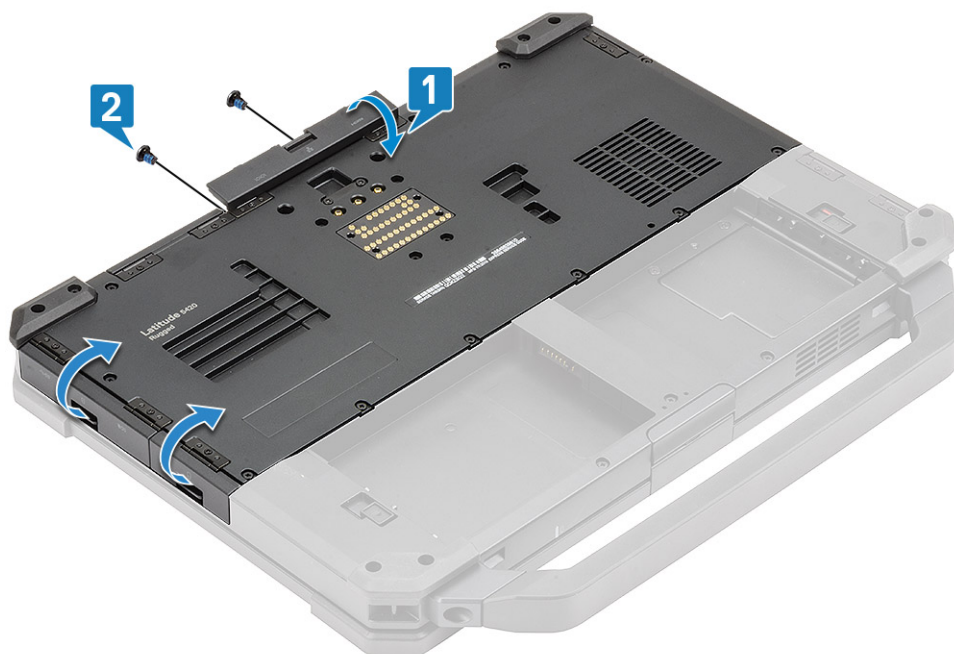
4. Remove the 17 'M2.5*5' screws on the bottom chassis cover [1] and remove the bottom chassis cover [2] from the computer.
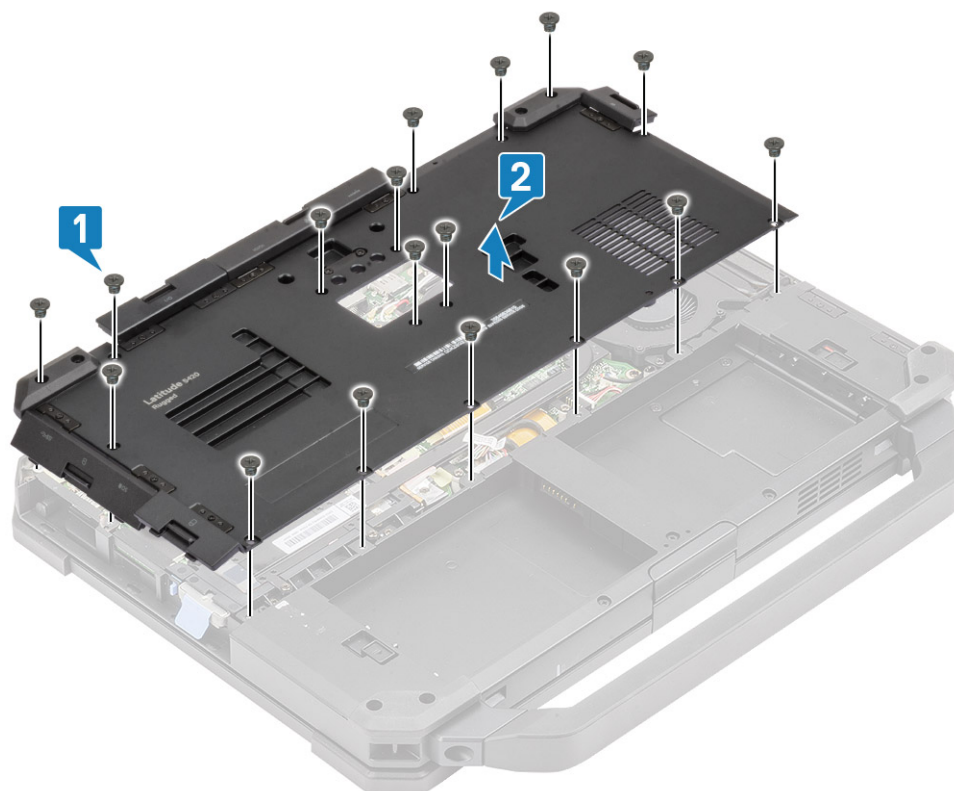
Installing the Bottom Chassis Cover

1. Install the bottom chassis cover over the bottom base [1] of the computer.
2. Install the 17 'M2.5*5' screws on the bottom chassis cover.
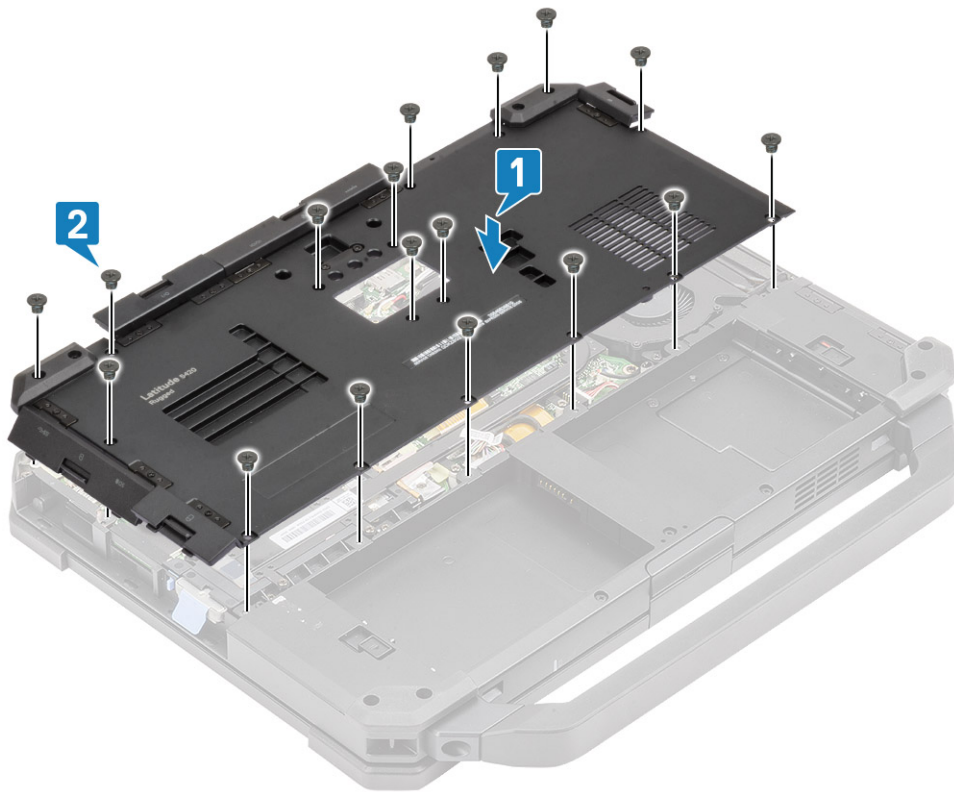
3. Tighten the two 'M2.5*6' screws [1] in the rear I/O space and close the rear and left I/O doors [2].
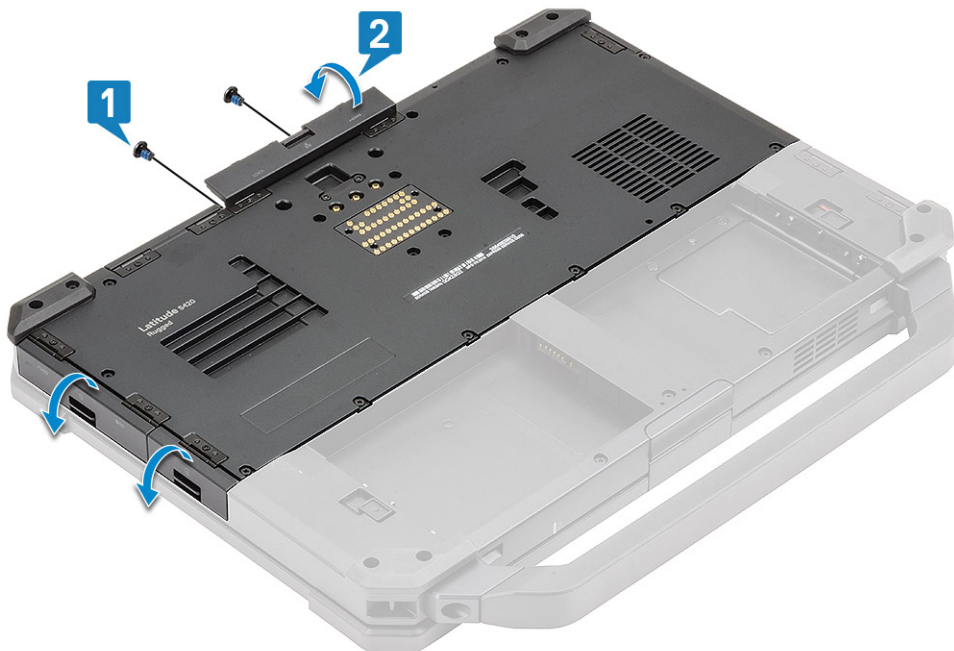
4. Install the:
   a. Batteries
5. Follow the procedure in After working inside your computer.

Keyboard

Removing the Keyboard

1. Follow the procedure in Before working inside your computer.
2. Remove the: Batteries.
3. Remove the six 'M2.5*5' screws on the keyboard [1] and pry at the bottom edge of the keyboard [2].

4. Slide the keyboard slightly [1] towards touch pad and flip it over inclined over the LCD panel [2].

5. Remove the four 'M2*3' screws [1] on the keyboard cover and remove it from the computer [2].

6. Peel-off the tape on the keyboard and back-light FPC [1] and disconnect it from the system board [2].

   ⓘ **NOTE:** Tweezers might be required to access the keyboard and back-light FPC connectors on the system board.

7. Separate the keyboard from the system [3].
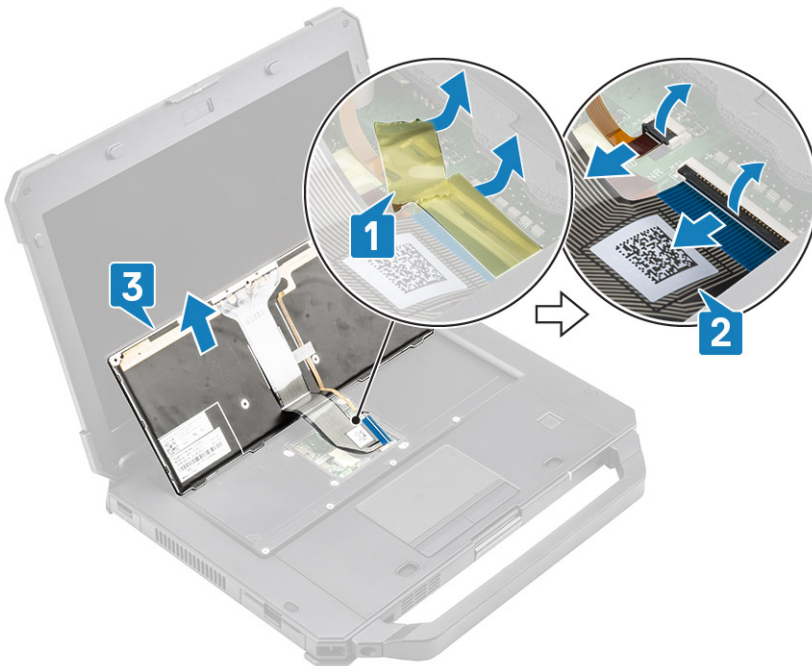
Installing the Keyboard

1. Install the keyboard [1] and connect the keyboard and back-light FPC to the system board [2].
2. Secure keyboard and back-light FPC connections using an insulation tape [3].
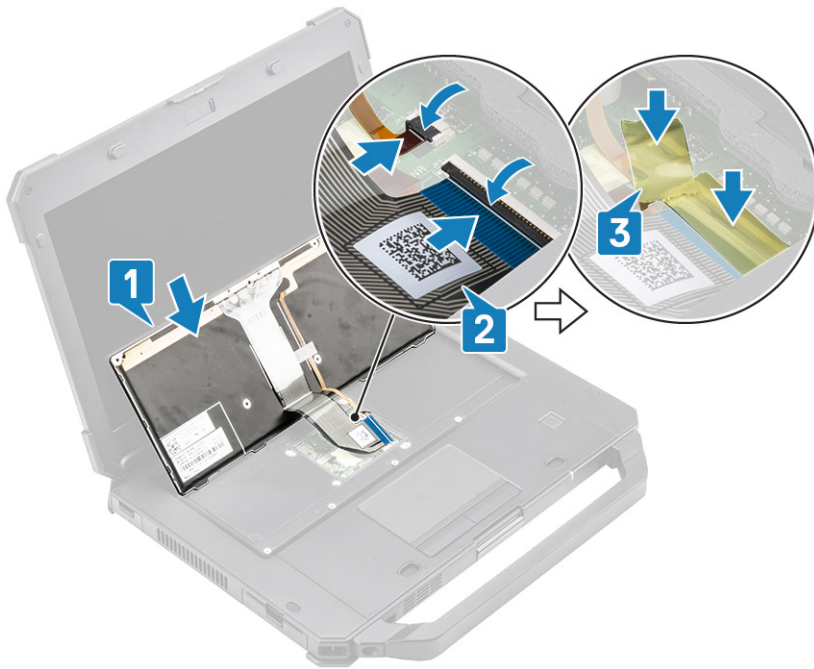
3. Install the keyboard cover [1] and tighten the four 'M2*3' screws [2] to secure it to the chassis.
4. Flip the keyboard [3] over on the chassis [3].
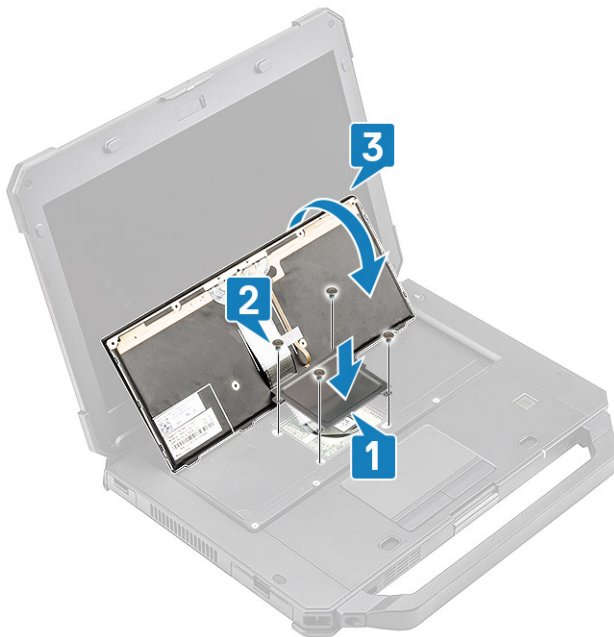
5. Slide the keyboard towards LCD [1] to align it to screw holes [2].
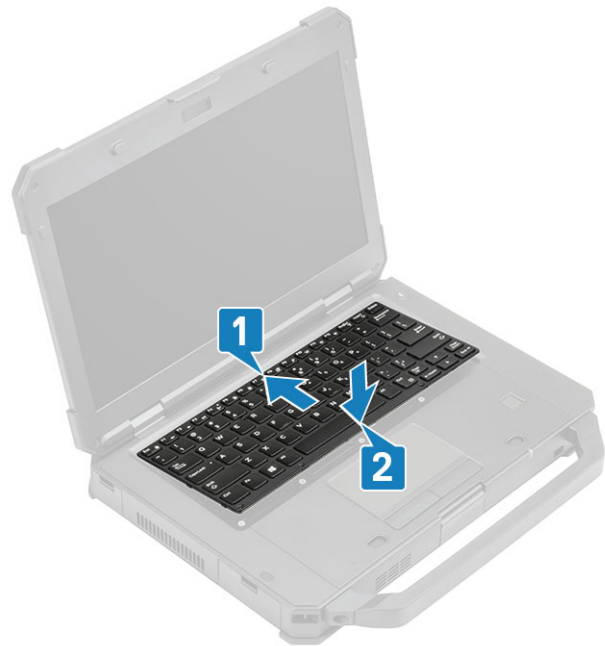
6. Install the six 'M2.5*5' screws on the keyboard to secure it to the computer.

7. Follow the procedure in After working inside your computer.

WWAN card

Removing the WWAN card

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
3. Remove the single 'M2*3' screw [1], remove the metal bracket [2] on the WWAN card.

4. Disconnect the antennae cables [3] and remove the WWAN card [4] out of the M.2 slot on the system board.

Installing the WWAN card

1. Install the WWAN card in the M.2 slot [1] on the system board and connect the antennae cables [2].
2. Secure the WWAN card using the metal bracket [3] and tighten the single M2.3 screw [4] securing the WWAN card to the system board.
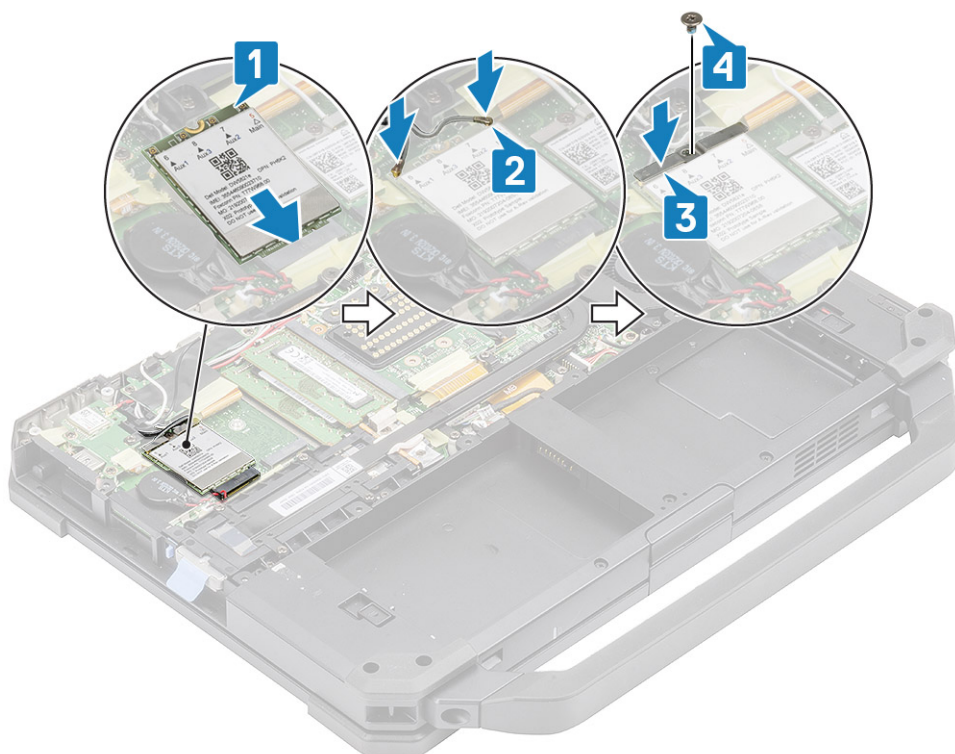
3. Install the:

a. Bottom chassis cover
b. Batteries

4. Follow the procedure in After working inside your computer.

WLAN card

Removing the WLAN card
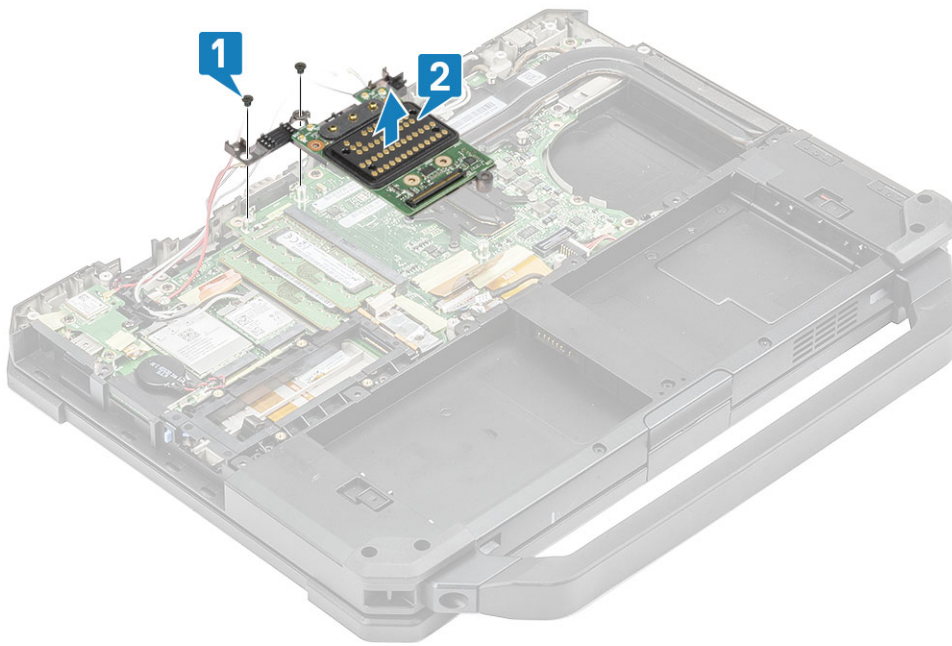
1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
3. Remove the single 'M2*3' screw [1] and remove the metal bracket [2] on the WLAN card.
4. Disconnect the antennae cables [3] and remove the WLAN card out from the M.2 slot [4] on the system board.
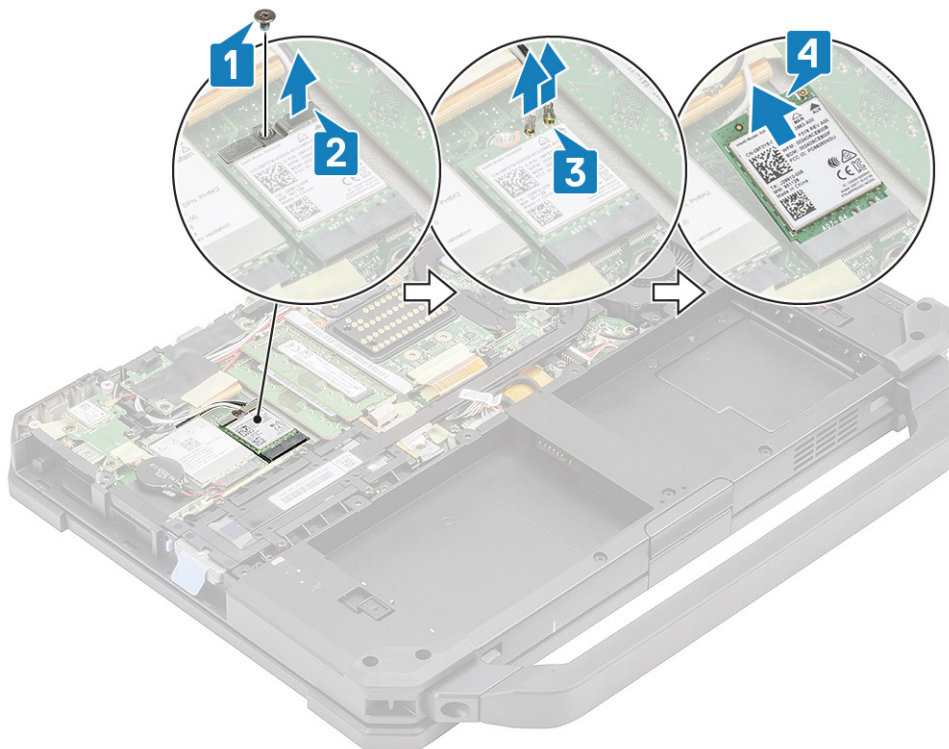
Installing the WLAN card

1. Install the WLAN card into the M.2 slot [1] on the system board and connect the antennae cables [2].
2. Place the metal bracket on the WLAN card [3] and secure it using the single 'M2*3' screw [4].
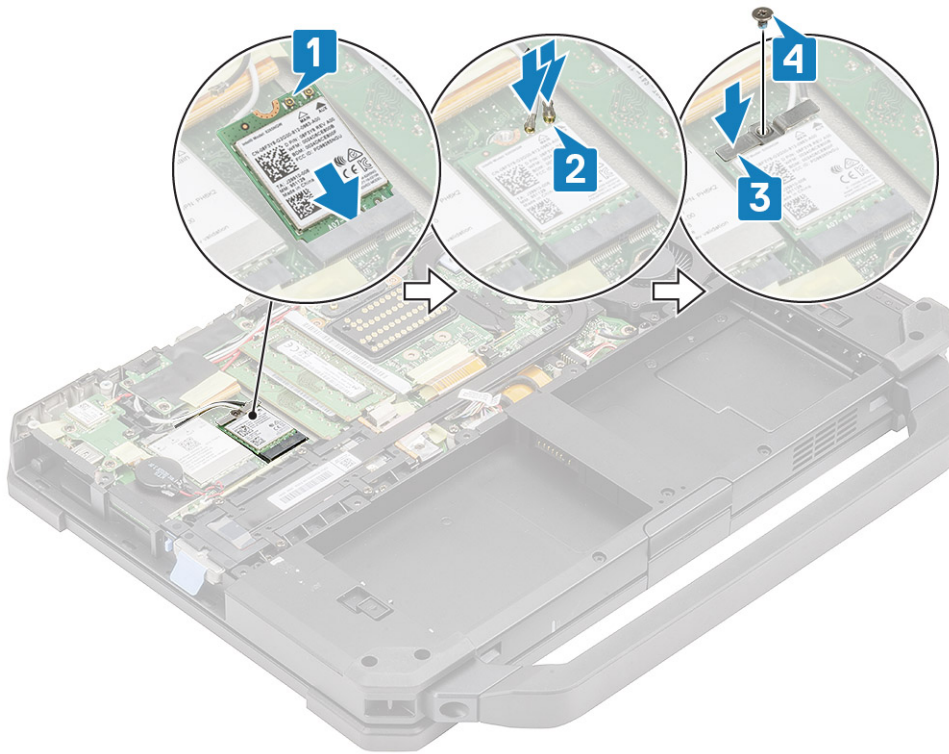
3. Install the:
   a. Batteries
   b. Bottom chassis cover
4. Follow the procedure in After working inside your computer.

Global Positioning System (GPS)

Removing the GPS module

1. Follow the procedure in Before working inside your computer.
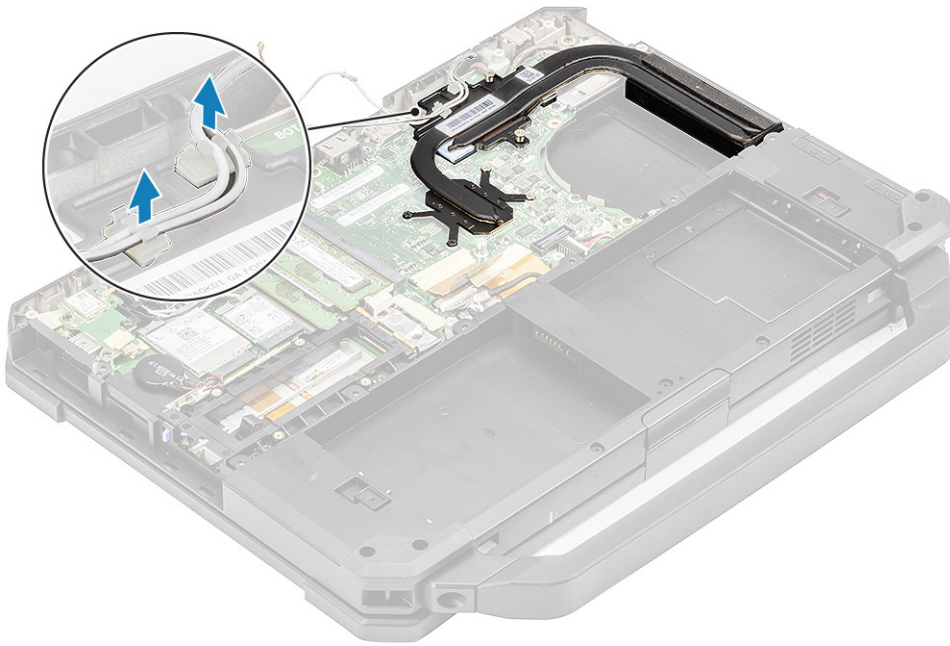2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. Rear I/O board
3. Unroute the aux cables [1] for WLAN and WWAN and disconnect the antennae cable [2] on GPS module.
4. Unroute the main antennae cables [3] and loosen the single 'M2.5*5' screw [4] to separate the RF bracket [5] from the system board.
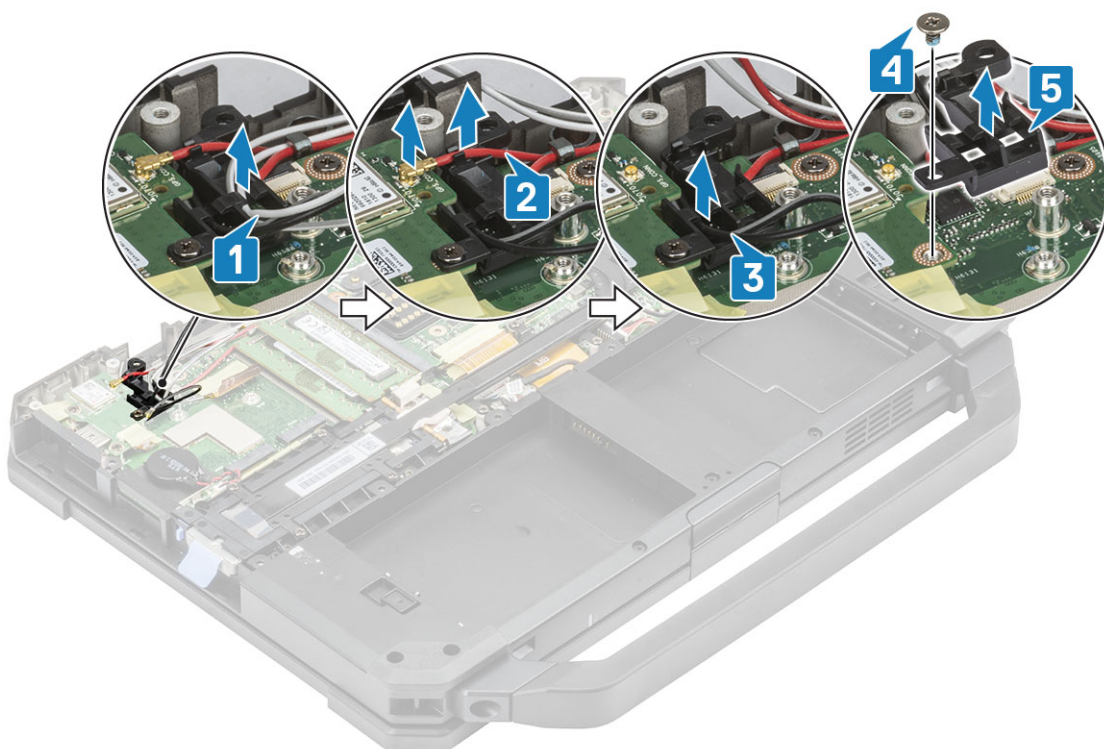
5. Peel off the inductive tape on the GPS FPC connector [1] and disconnect the GPS FPC connector [2] from GPS module.
6. Remove the two 'M2.5*5' screws [3] and separate the GPS module [4] from the system board.
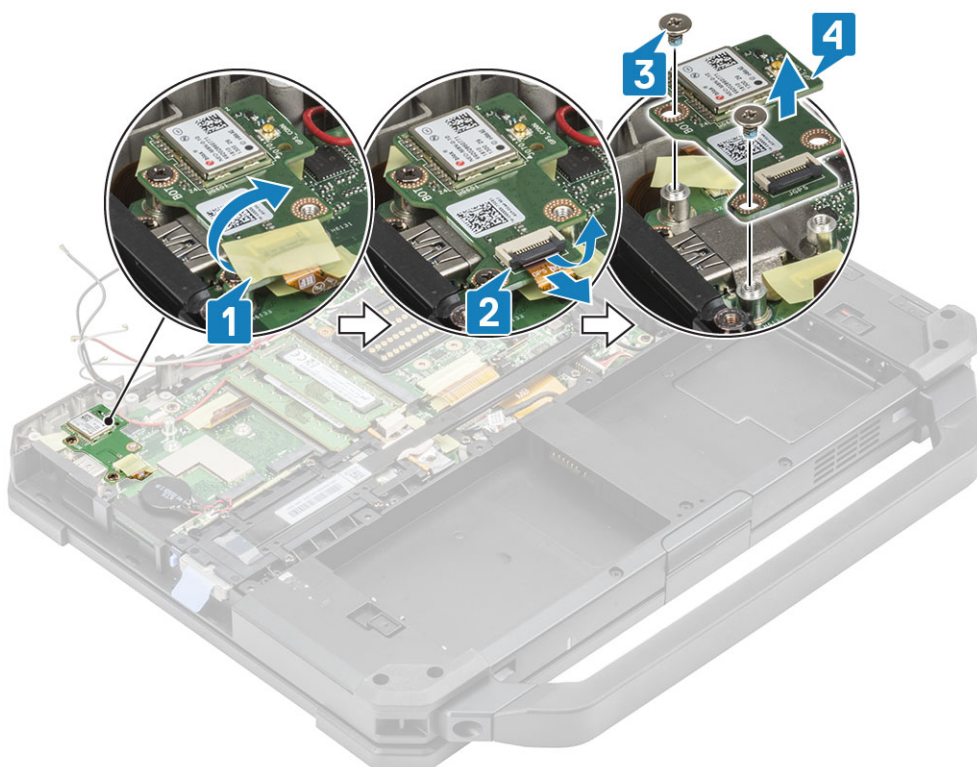
Installing the GPS module

1. Align and place the GPS module on the system board and tighten the two 'M2.5*5' screws on GPS module [2].
2. Connect the GPS FPC(system board side first) [3] and secure it using a piece of tape [4].
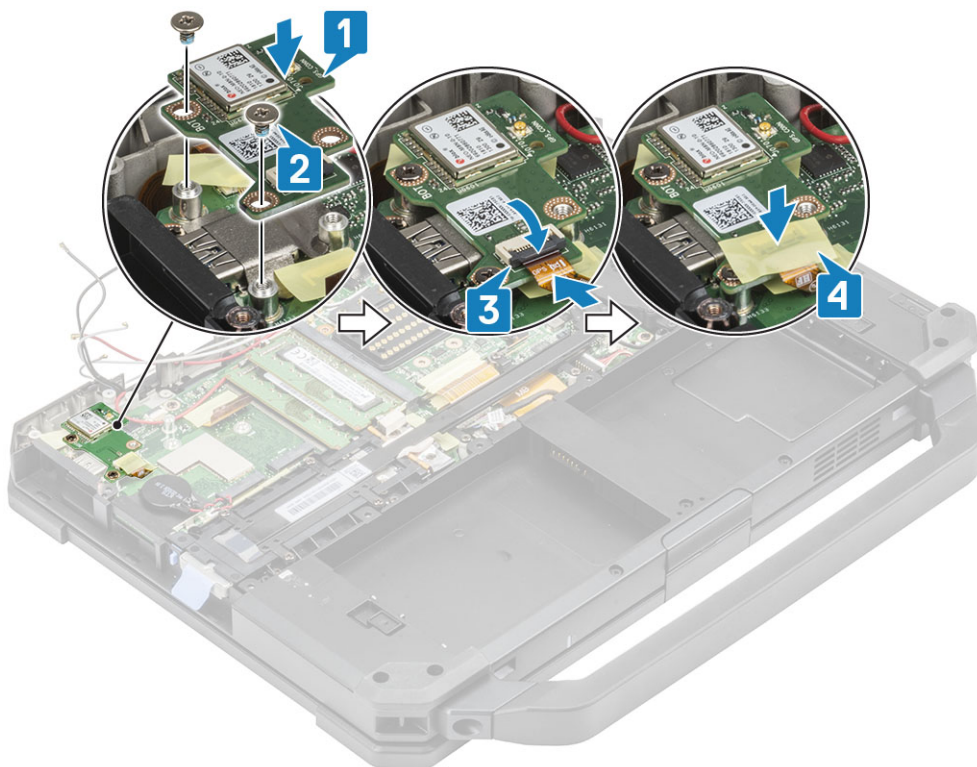
3. Install the RF bracket [1] on the system board and secure it using the single 'M2.5*5' screw [2].
4. Route the aux cables for WLAN and WWAN cards through the RF bracket [3].
5. Connect the antennae cable [4] on GPS module and route the main antennae cables [5] through the RF bracket.
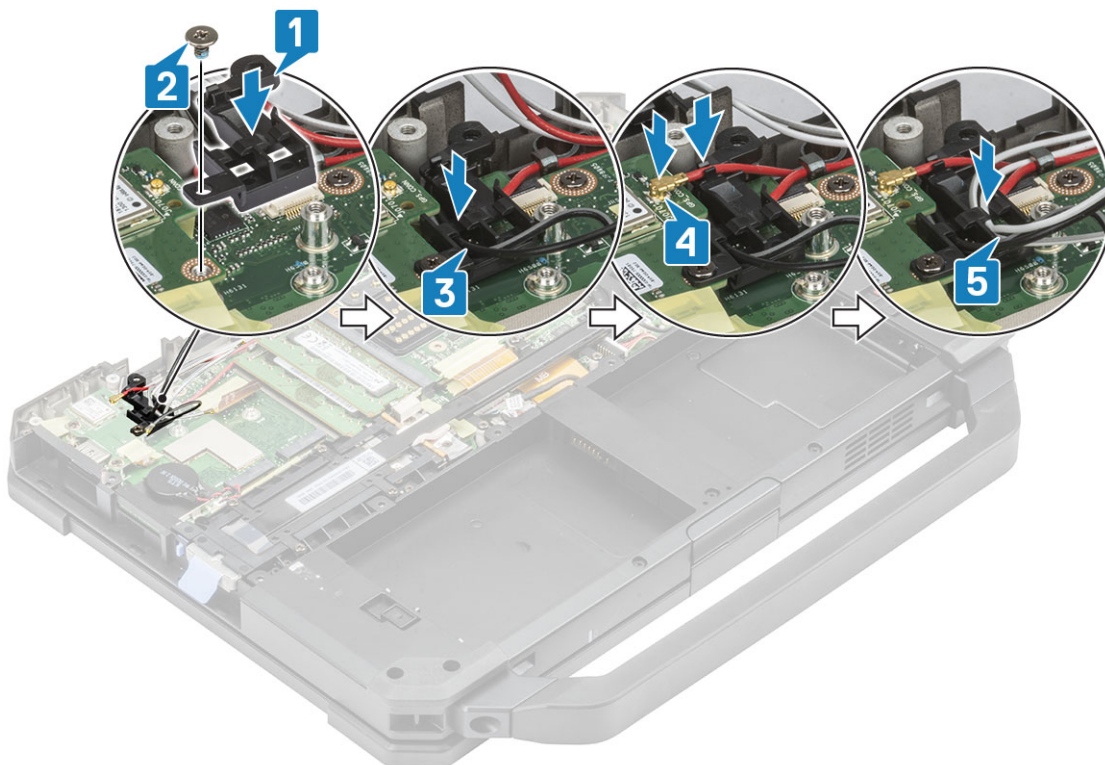
6. Install the:
   a. Rear I/O board
   b. Bottom Chassis Cover
   c. Batteries
7. Follow the procedure in After working inside your computer.

Memory modules

Removing the Memory

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
3. Pull the clips securing the memory module [1] until the socket disengages and remove the memory module from the memory socket [2] on the system board.
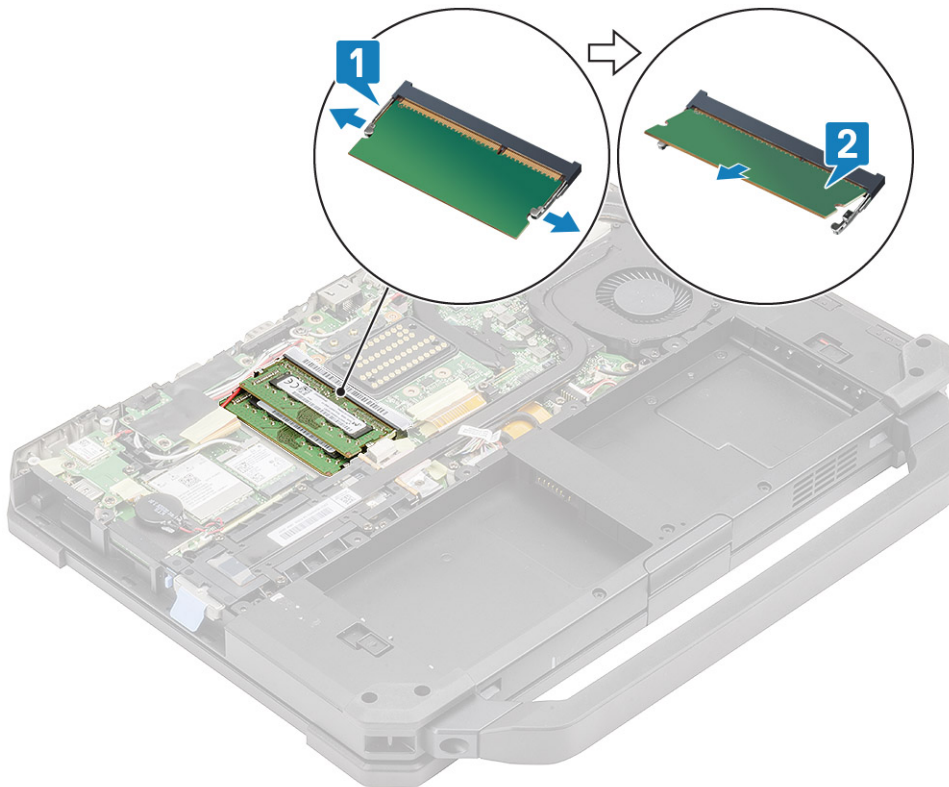
Installing the Memory

1. Align and insert the memory module along the keyed notch [1] at an acute angle and press the memory module [2] until securing clips engages.
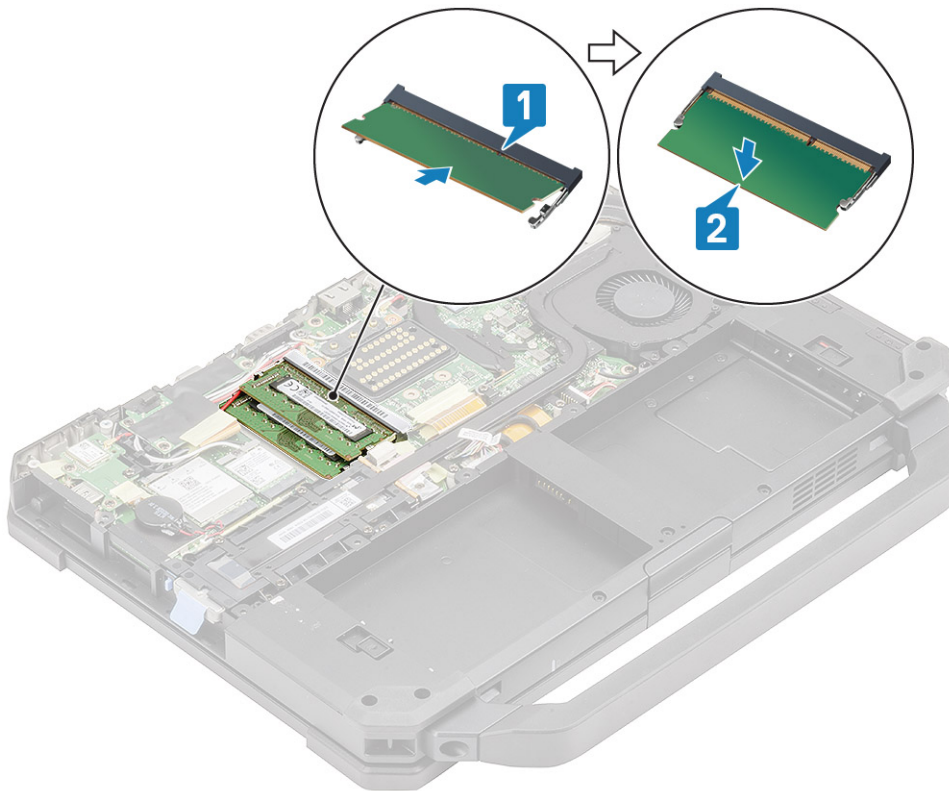
2. Install the:
   a. Batteries
   b. Bottom Chassis Cover
3. Follow the procedure in After working inside your computer.

Coin-cell battery

Removing the Coin cell

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Bottom chassis cover
   b. Batteries
3. (i) **NOTE:** Removing or Disconnecting the coin cell may reset systemboard / BIOS / system time to defaults or engage bit locker or other similar security protocol devices.

   Disconnect the coin cell connector from the system board [1] and remove it from the system [2].
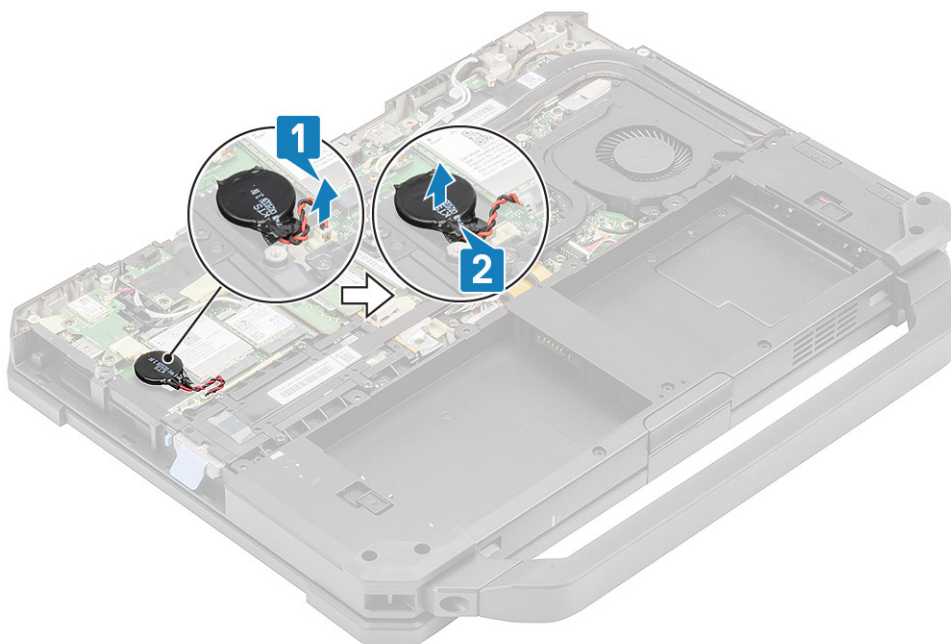
Installing the Coin cell

1. Install the coin cell [1] and connect the coin cell connector to the system board [2].
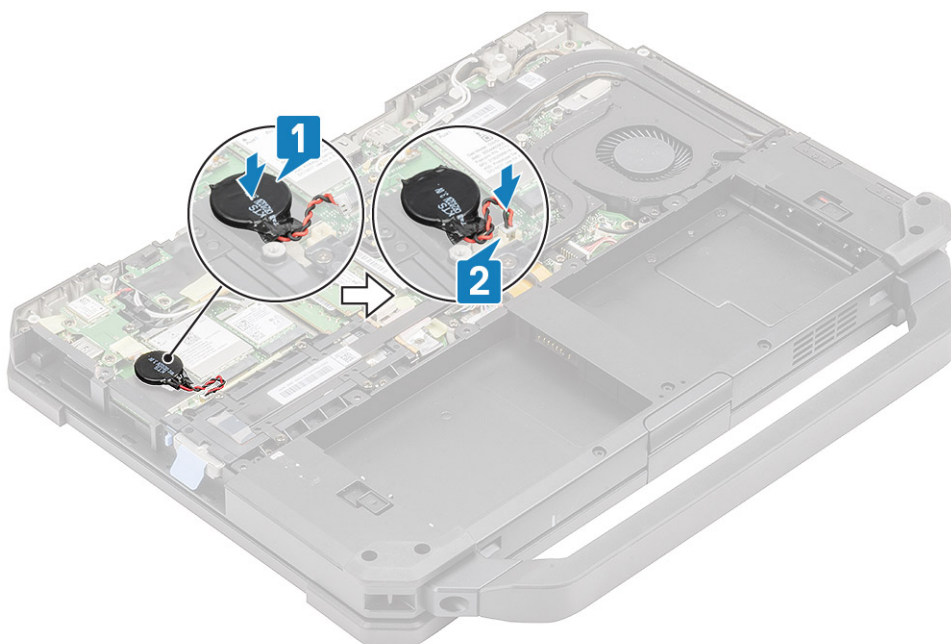
2. Install the:
   a. Bottom chassis cover
   b. Batteries
3. Follow the procedure in After working inside your computer.

PCIe Heatsink Fan Assembly

Removing the PCIe Heatsink fan assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
3. Disconnect the fan cable [1], loosen the four 'M2*3' screws from fan case [2].
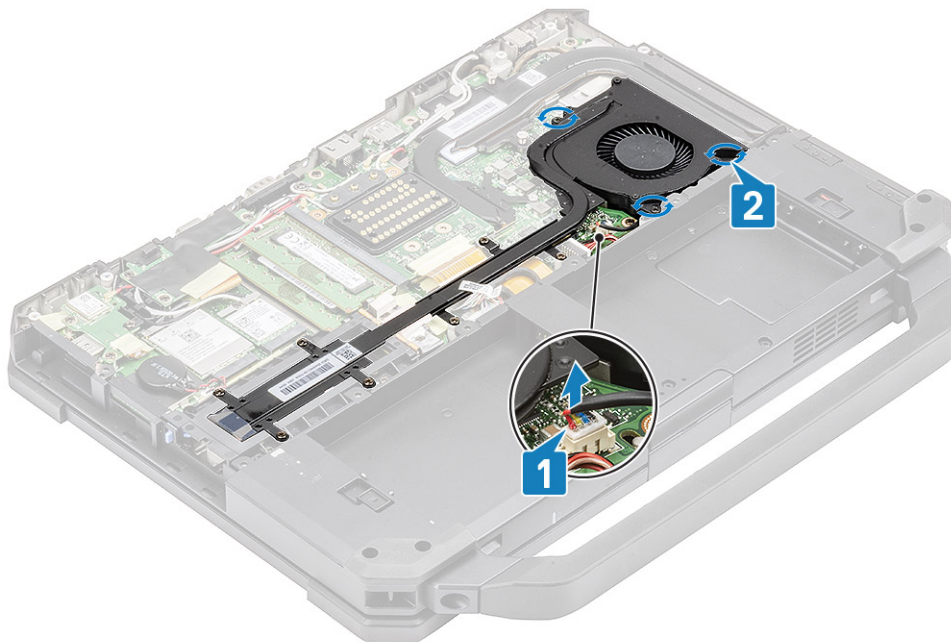
4. Loosen the seven 'M2.5*5' screws [1] from heat sink pipe and remove the PCIe heatsink assembly from the computer [2].
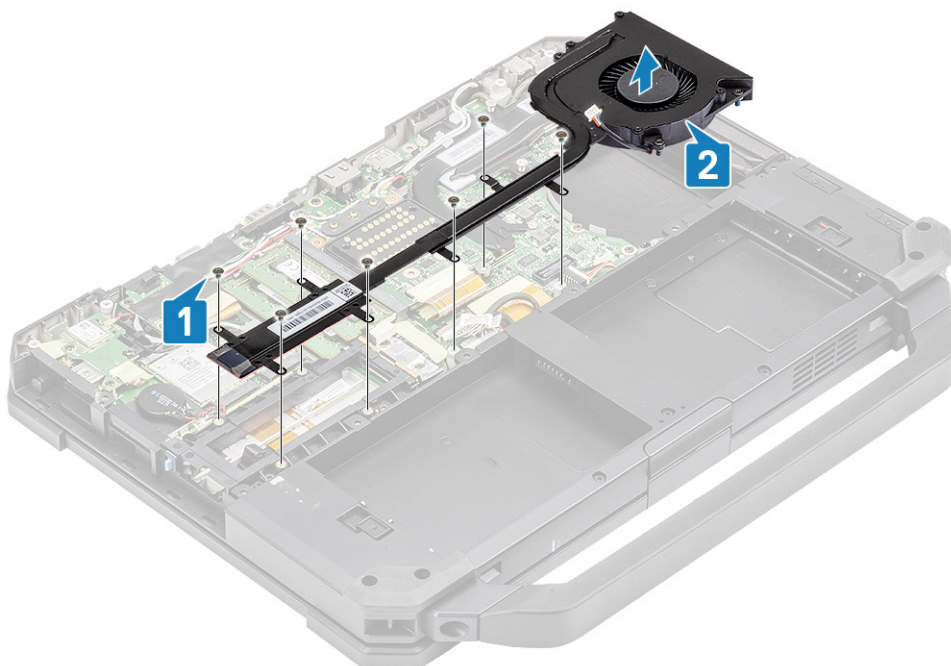
5. Remove the four M2*3 screws [1] to separate the heatsink from the fan [2].
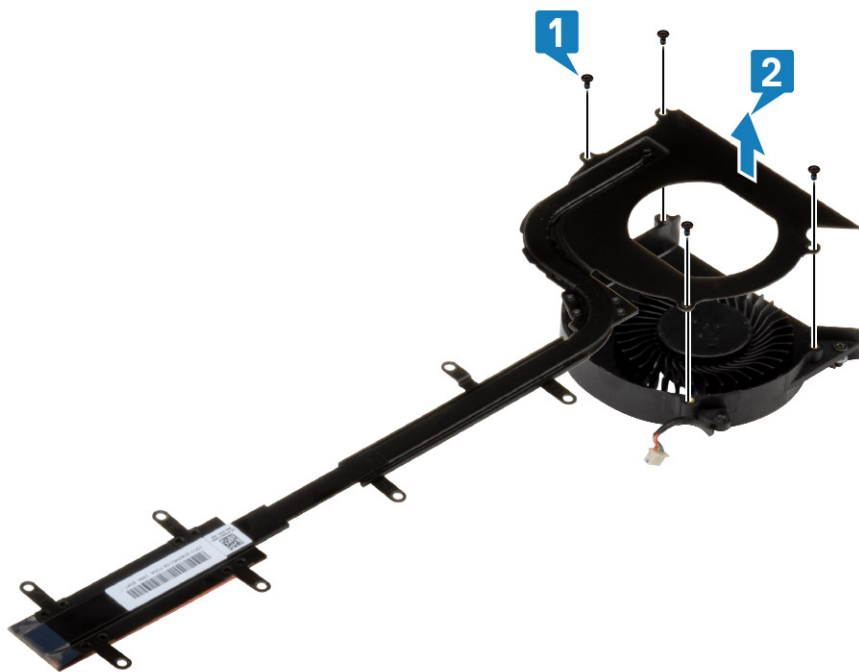
Installing the PCIe heatsink fan assembly

1. Replace the fan to th heatsink assembly [1] and secure it using four M2*3 screws [2] .
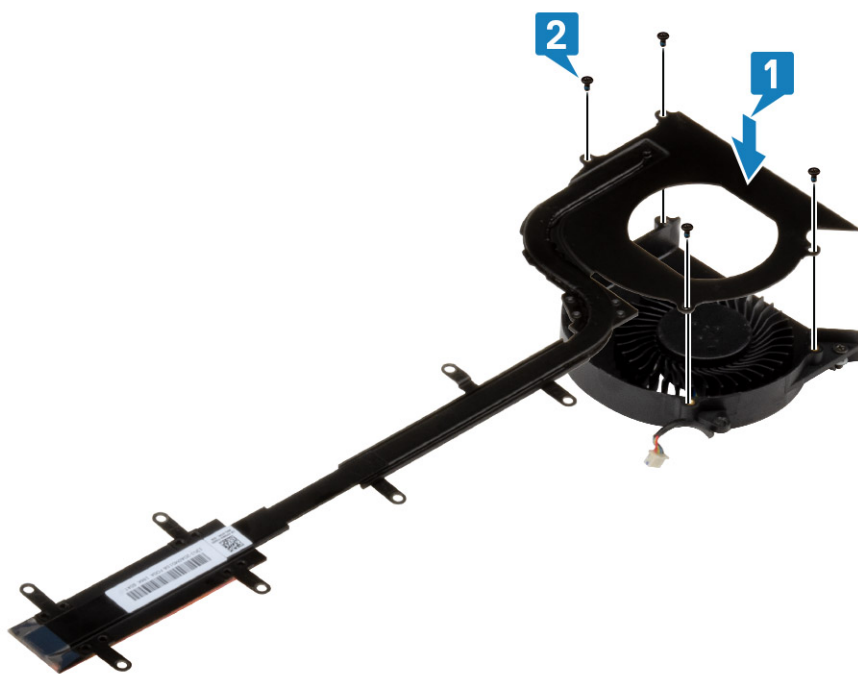
2. Install the PCIe heatsink assembly [1] in the computer and install the seven 'M2.5*5' screws on heat sink pipe [2].
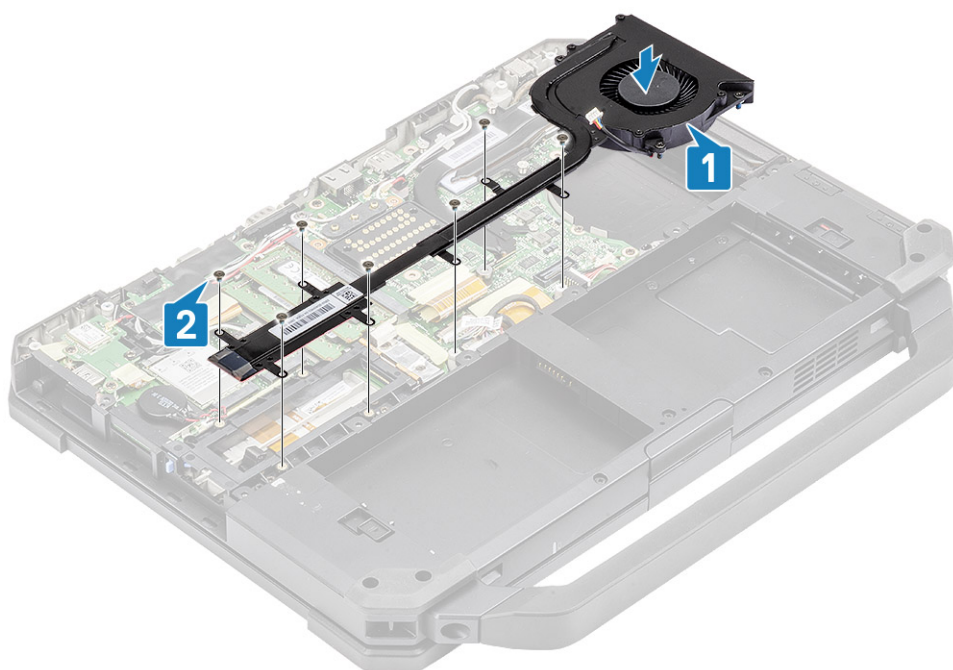
3. Tighten the three 'M2*3' screws on the fan case [1] and connect the fan cable [2].
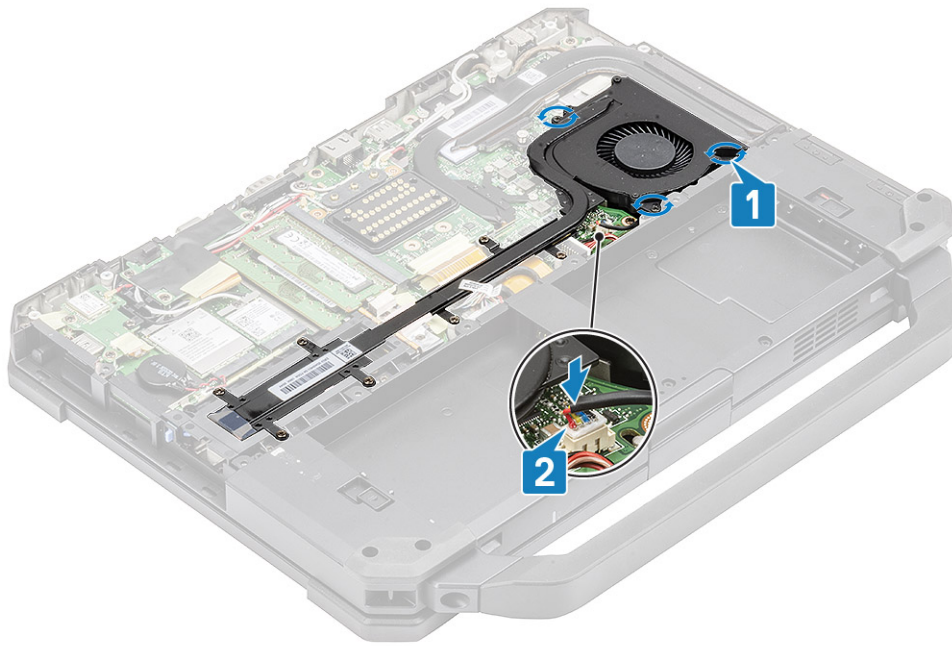
4. Install the:
   a. Bottom chassis cover
   b. Batteries
5. Follow the procedure in After working inside your computer.

Primary SSD Rail

Removing the Primary SSD rail

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. SSD
   c. Bottom chassis cover
   d. PCIe heatsink assembly
3. Peel off the inductive tape on the SSD FPC connector [1] on system board and disconnect it [2].
4. Remove the 4 'M2*3' screws [3] and remove it from the computer [4].
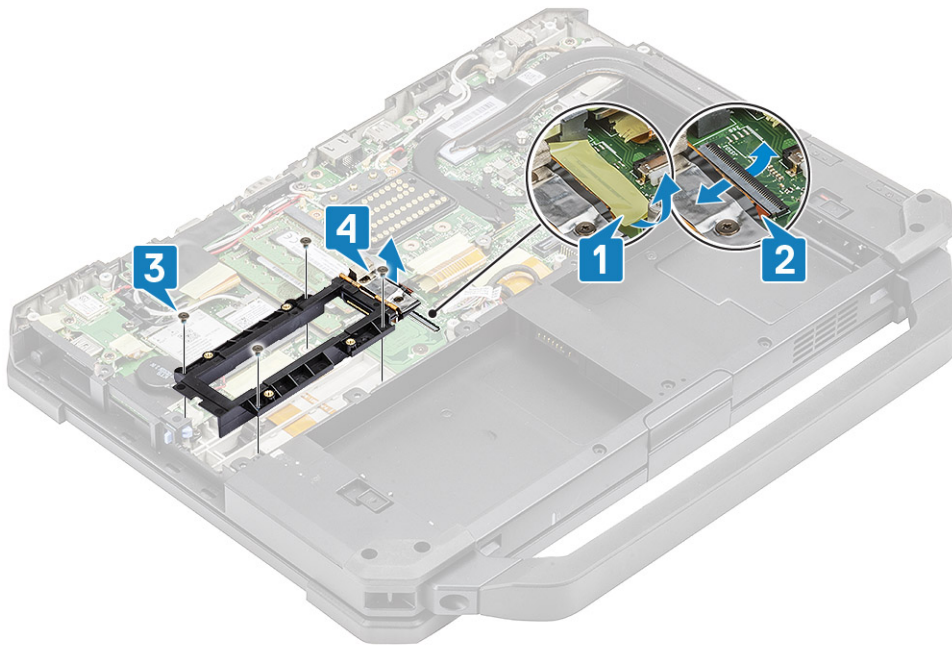
Installing the Primary SSD rail

1. Install the primary SSD rail on the system board [1] and connect the SSD FPC connector to the system board [2].
2. Secure the FPC connection using a piece of tape [3] and install the four 'M2*3' screws [4] securing it to the system board.
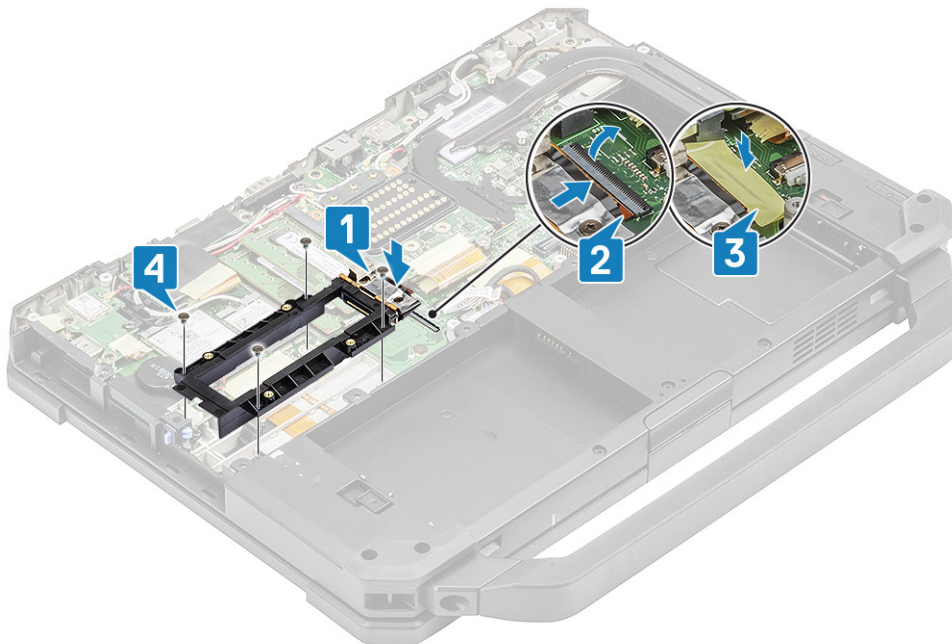
3. Install the:
   a. PCIe heatsink fan assembly
   b. Bottom chassis cover
   c. SSD
   d. Batteries
4. Follow the procedure in After working inside your computer.

Docking Port Assembly

Removing the Docking port assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. PCIe Heatsink assembly
3. Peel off the tape securing the dock FPC [1] and disconnect the dock FPC [2].
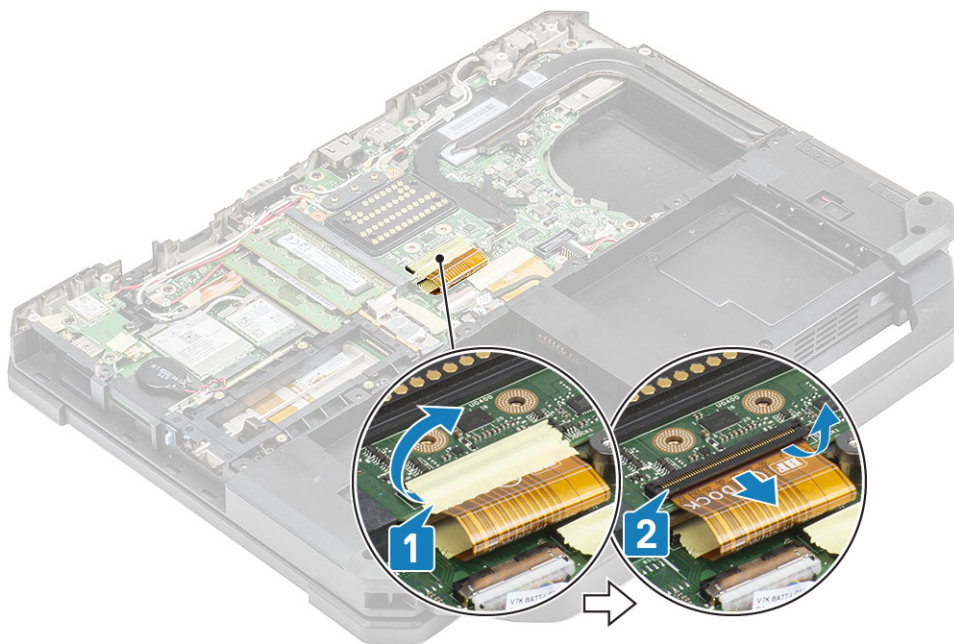
4. Disconnect the antennae cables from RF passthrough connectors [1] and unroute the antennae cables [2] from the routing channels on the dock assembly.
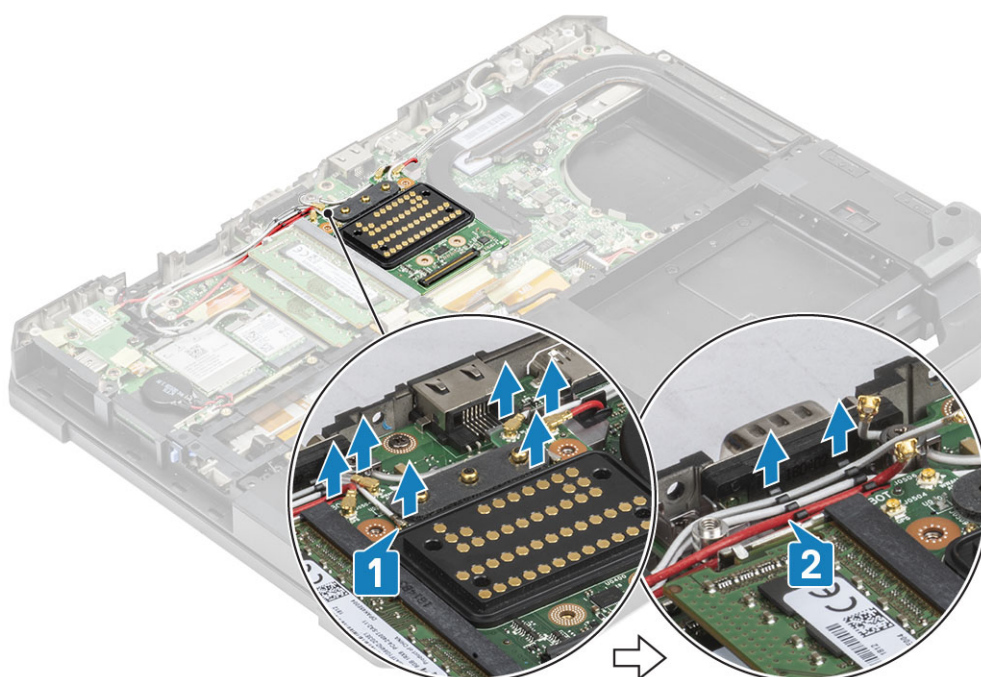
5. Remove the two 'M2.5*5' screws [1] and separate the docking board assembly from the chassis [2].

Installing the Docking Port Assembly

1. Install the docking port assembly [1] and install the two 'M2.5*5' screws [2] securing it to the system board.
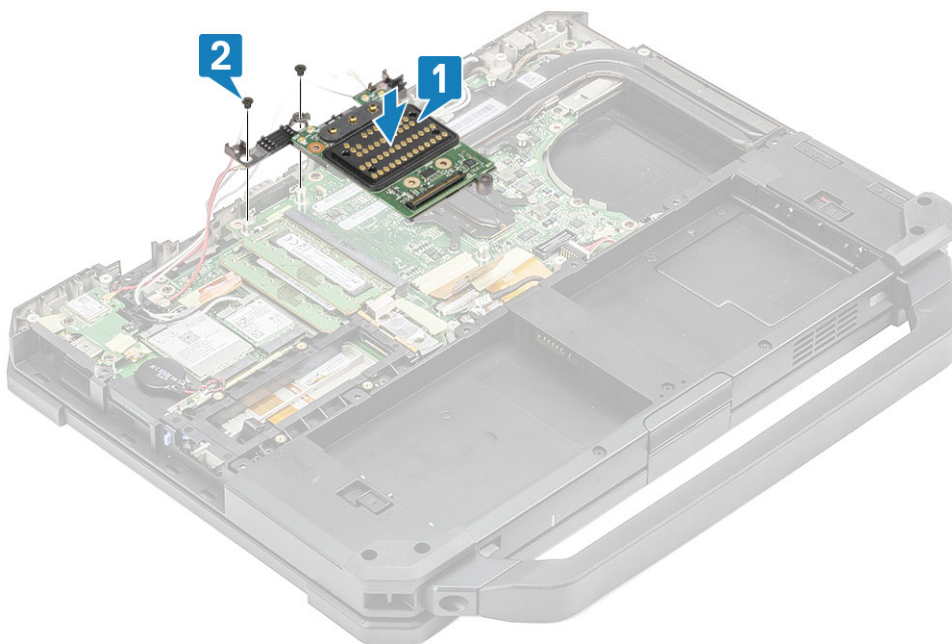
2. Connect the dock FPC [1] and secure it using a piece of tape [2].
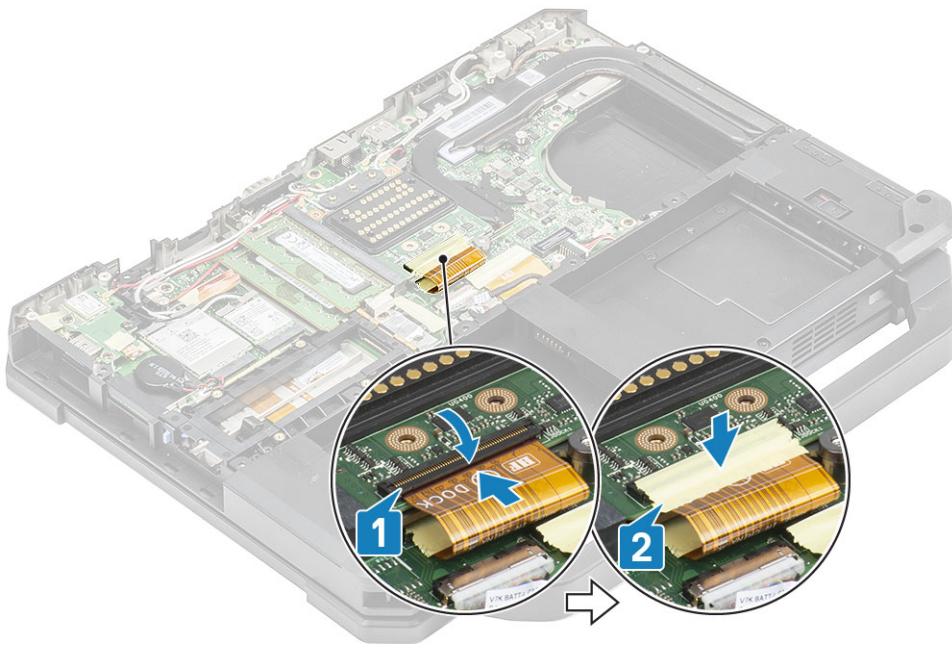
3. Secure the antennae cables along the routing channels [1] and connect the antennae cables on RF passthrough connectors [2].
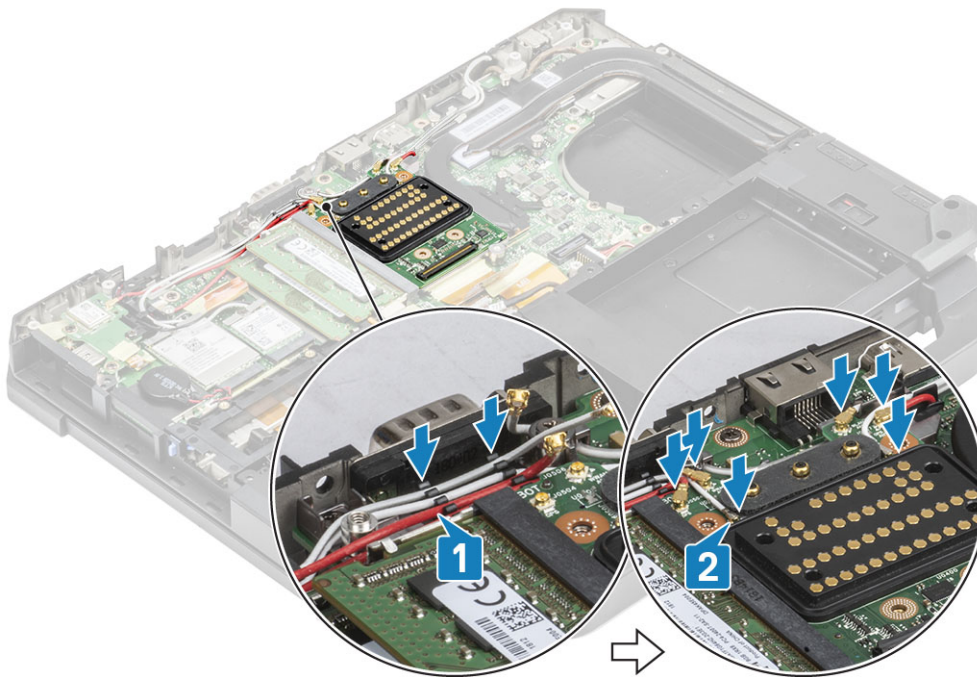
4. Install the:
   a. PCIe Heatsink assembly
   b. Batteries
   c. Bottom chassis cover
5. Follow the procedure in After working inside your computer.

Heatsink Assembly

Removing the Heatsink assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. WLAN card
   d. WWAN card
   e. PCIe Heatsink fan assembly
   f. Docking port assembly
3. ⓘ **NOTE:** Depending on the order configuration details the system may have either of the heatsink assembly.
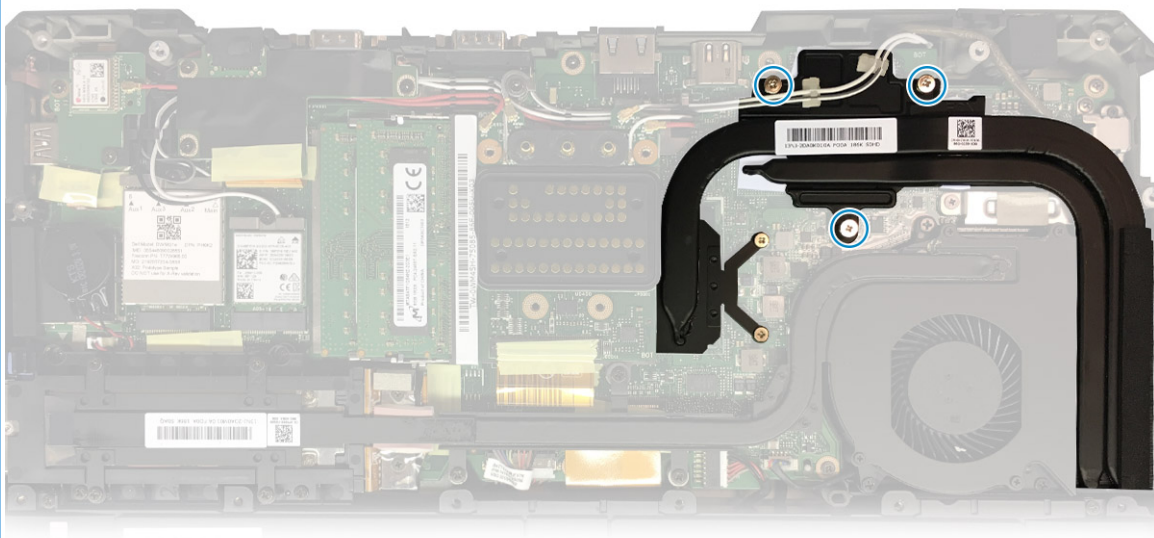
DSC Heatsink
assembly

Unroute the antennae cables from the tabs on the heatsink pipe.

4. Remove the five 'M2.5*5' screws [1] and two 'M1.6*5' [2] screw from the thermal module.
5. Lift and the heat sink assembly from the computer [3].
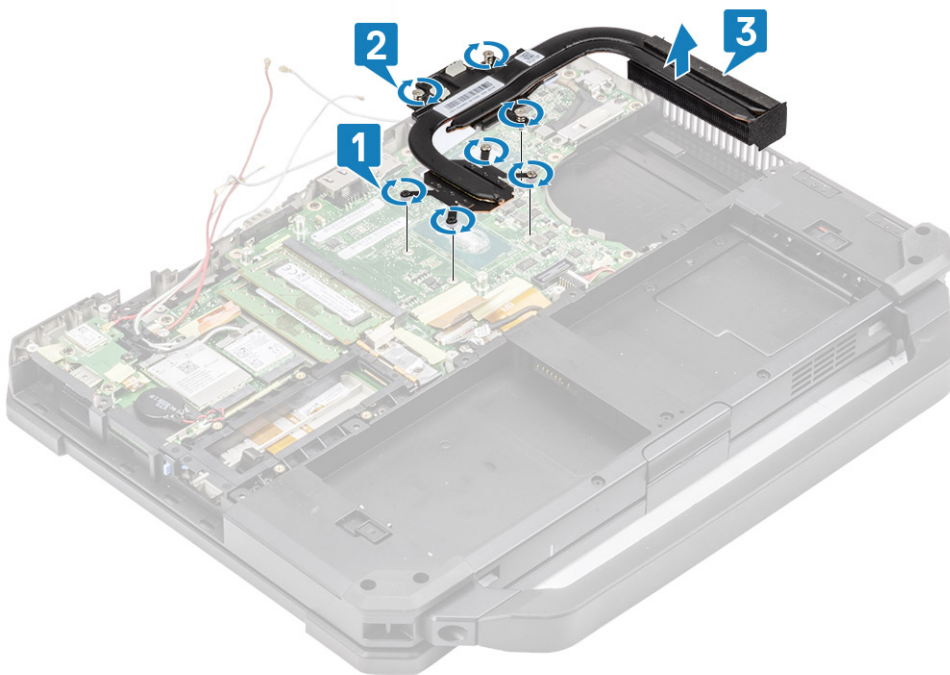
ⓘ **NOTE:** Discreet and UMA bases have different types of heatsink assembly.

Installing the Heatsink assembly

1. Install the heatsink assembly [1] in the computer and tighten the two 'M1.6*5' [2] cap screw near the CPU.
2. Install the five 'M2.5*5' captive screws [3] on the thermal module securing the thermal module to the system board.
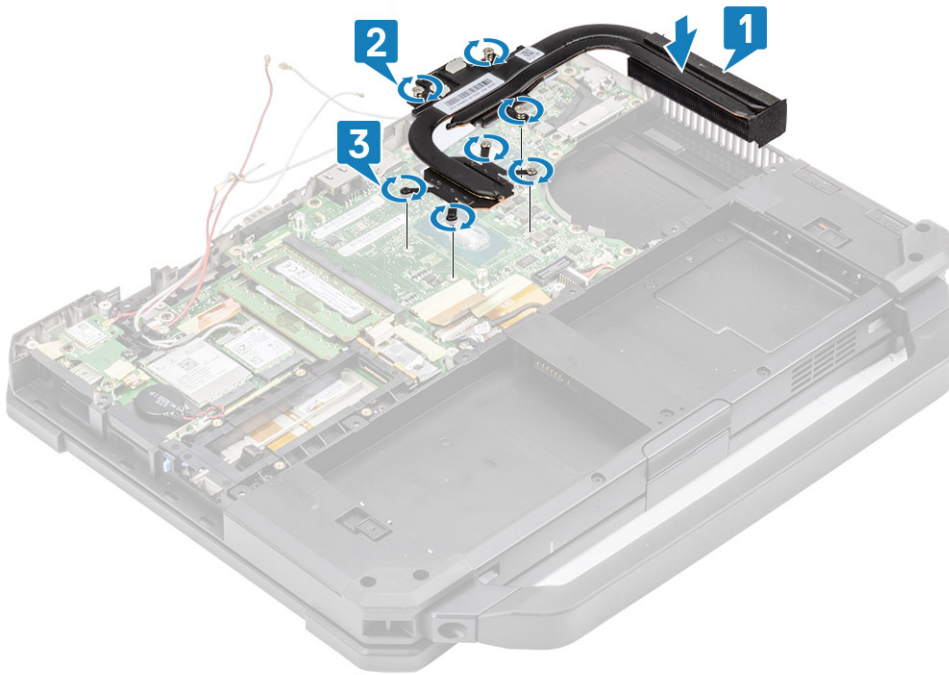
3. Route the antennae cables along the routing channel on the heatsink pipe.
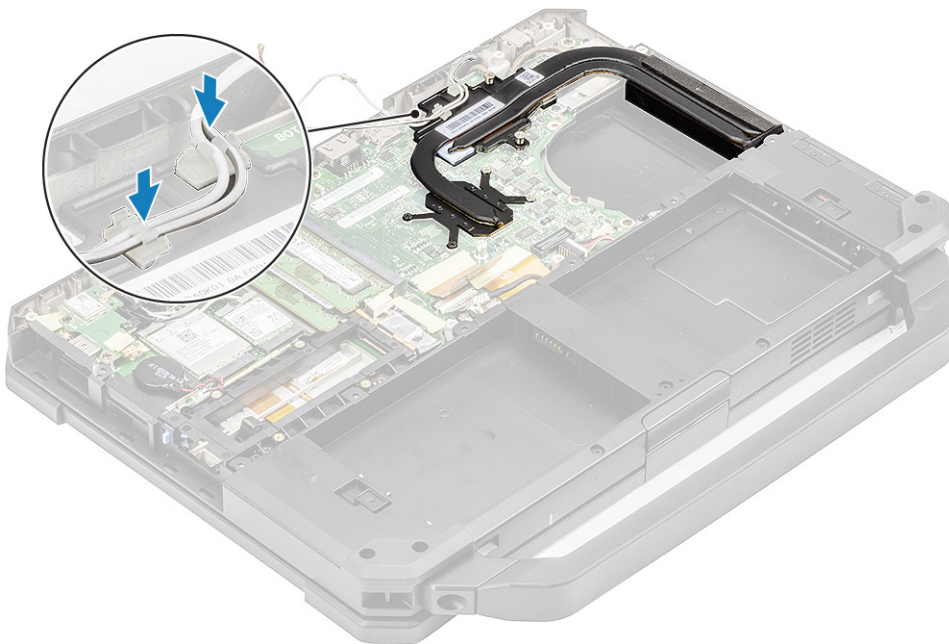
4. Install the:
   a. Docking port assembly
   b. PCIe Heatsink assembly
   c. WWAN card
   d. WLAN card
   e. Bottom chassis cover
   f. Batteries
5. Follow the procedure in After working inside your computer.

Rear Input-Output Board

Removing the Rear I-O board

1. Follow the procedure in Before working inside your computer.

   (i) **NOTE:** A 5 mm socket wrench should be used to remove/install the caps screws located in rear I/O space.

2. Remove the:
   a. Batteries
   b. WLAN card
   c. WWAN card
   d. PCIe heatsink fan assembly
   e. Docking port assembly
   f. Bottom chassis Cover

   ⚠ **CAUTION: The following epoxy screw locations will require additional focus. These screws are difficult to remove and there may be damage during the removal process. To prevent damage to the screws and surrounding plastics, please use the correct screwdriver for each screw type.**

3. Loosen the two epoxy cap screws on the serial port in the rear I/O space [1].
4. Peel off the inductive tape on the I/O board FPC connector [2] and disconnect it [3] from the system board.
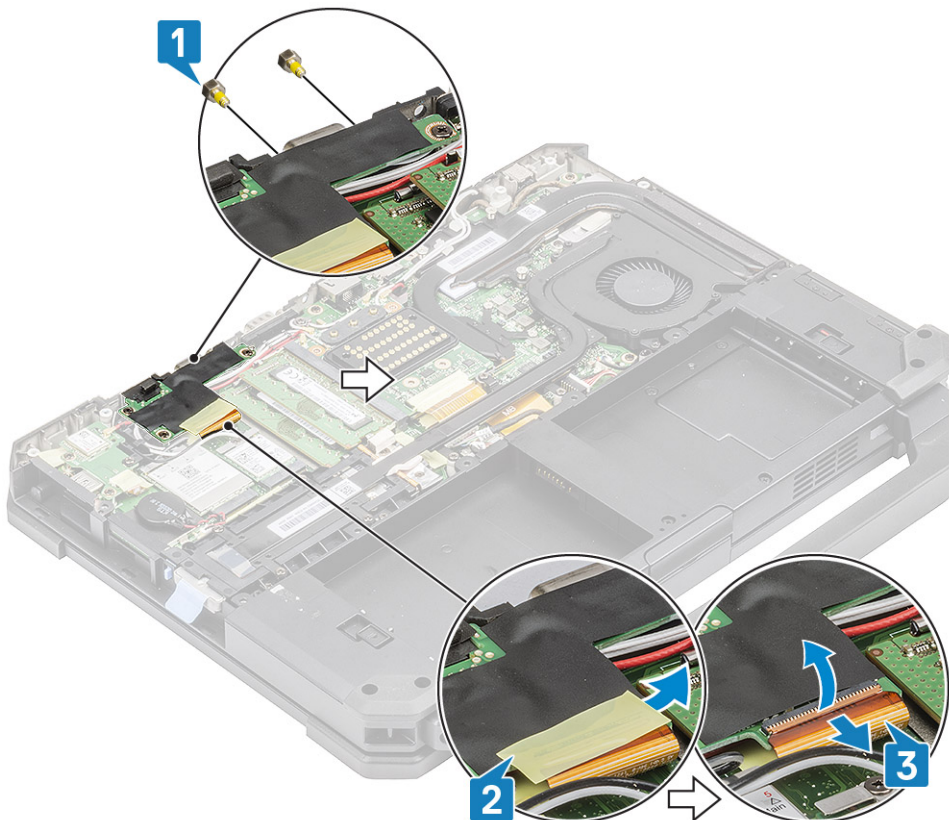
5. Loosen the three 'M2.5*5' screws [1] and lift the I/O board away from the system [2].
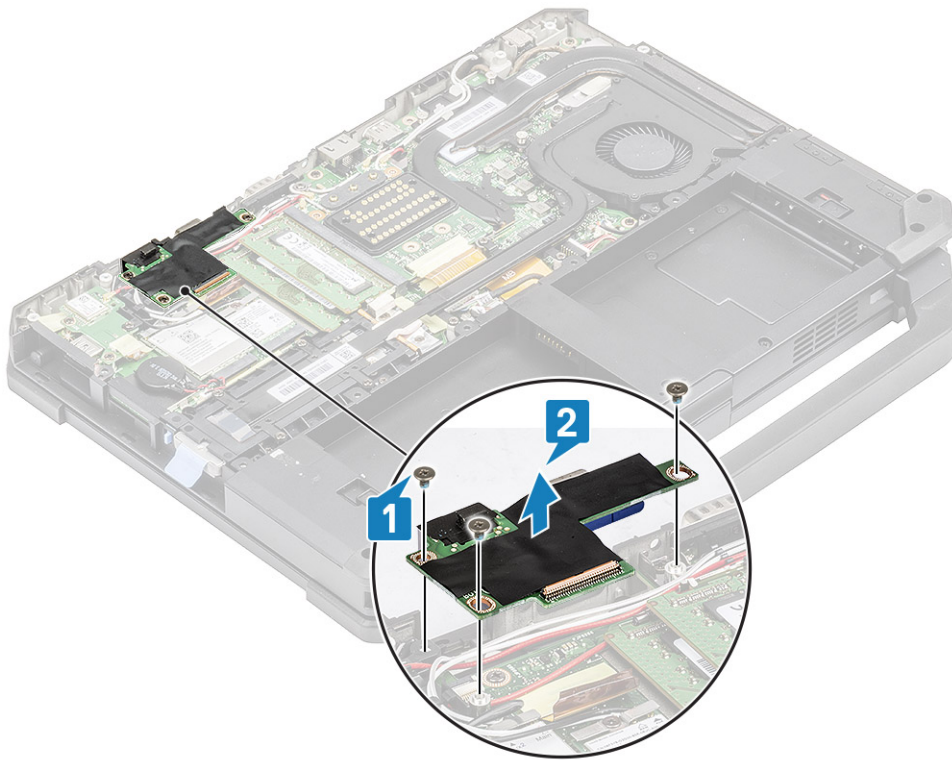
Installing the Rear I-O board

1. Install the rear I/O board on the system board and slide the serial port through the face plate [1].
2. Secure the I/O board using three 'M2.5*5' screws [2].
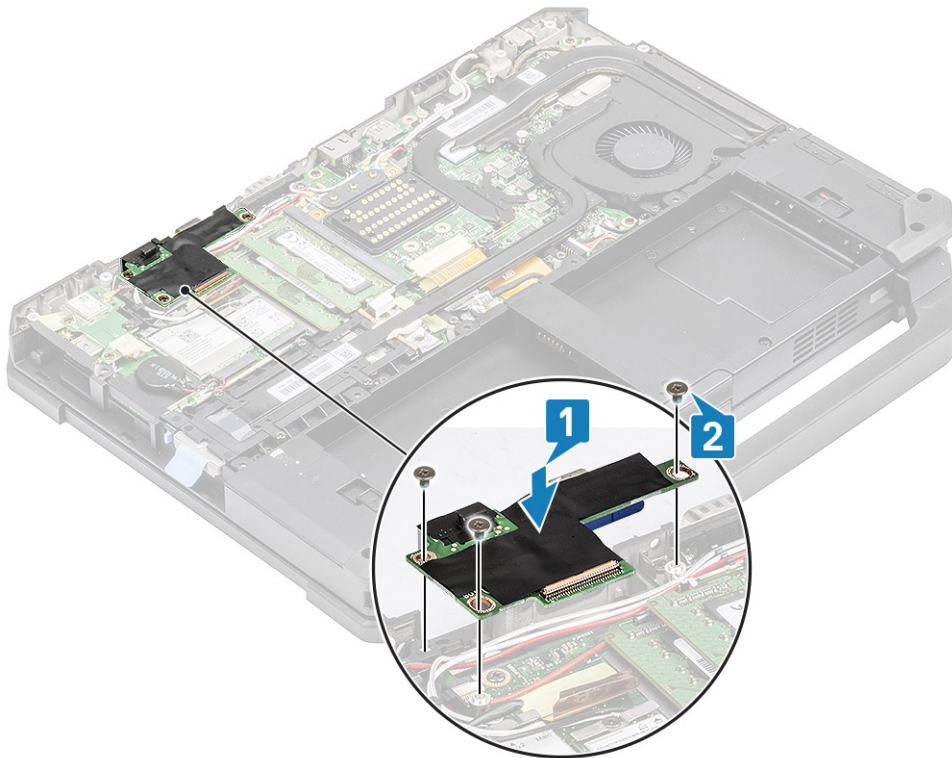
3. Tighten the two epoxy cap screws on the serial port [1] in the rear I/O space.
4. Connect the I/O board FPC [2] to the system board and then to I/O board itself [3] and secure it using a piece of tape [3].
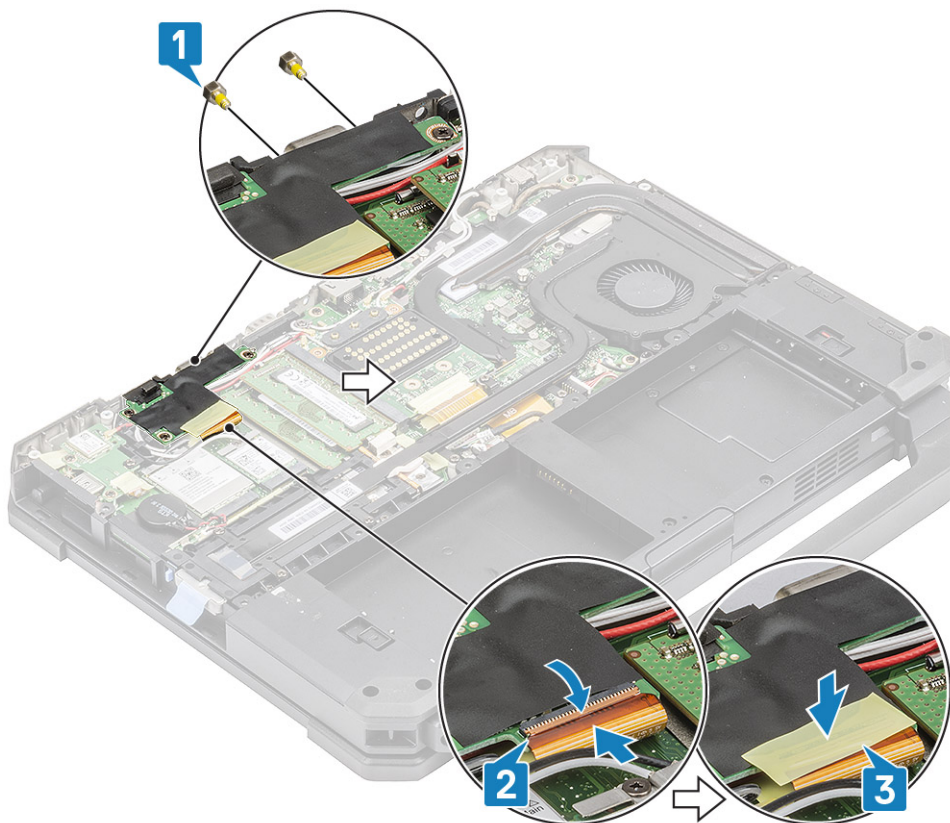
5. Install the:
   a. Docking port assembly
   b. PCIe heatsink fan assembly
   c. WWAN card
   d. WLAN card
   e. Bottom chassis cover
   f. Batteries
6. Follow the procedure in After working inside your computer.

Hinge Covers

Removing the Hinge Covers

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. Heatsink
3. Remove the two 'M2.5*5' on either sides [1] and lift to remove the brackets [2] from the computer.
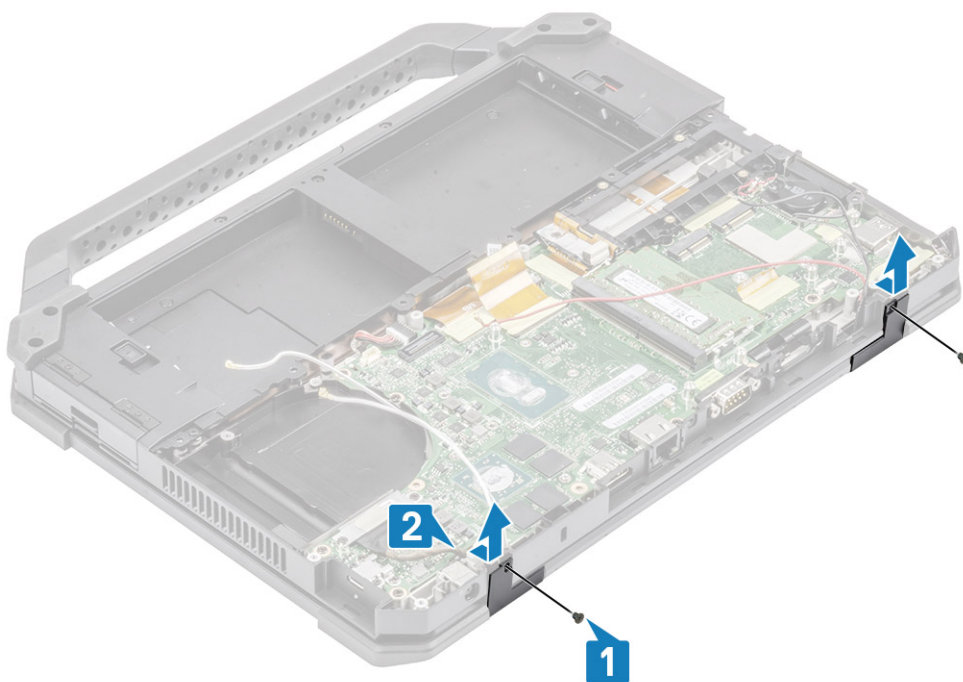
4. Press the latch [1] and open the LCD lid [2].

5. Hold the LCD lid at an obtuse angle and push the hinge covers from the rear end to remove it from the computer.

Installing the Hinge Covers

1. Press the latch [1] and open the LCD lid [2].

2. Keep LCD lid open at an obtuse angle and insert the hinge covers from front until it clicks in its place.

3. Place the brackets[1] and secure it using two 'M2.5*5' on either sides [2].
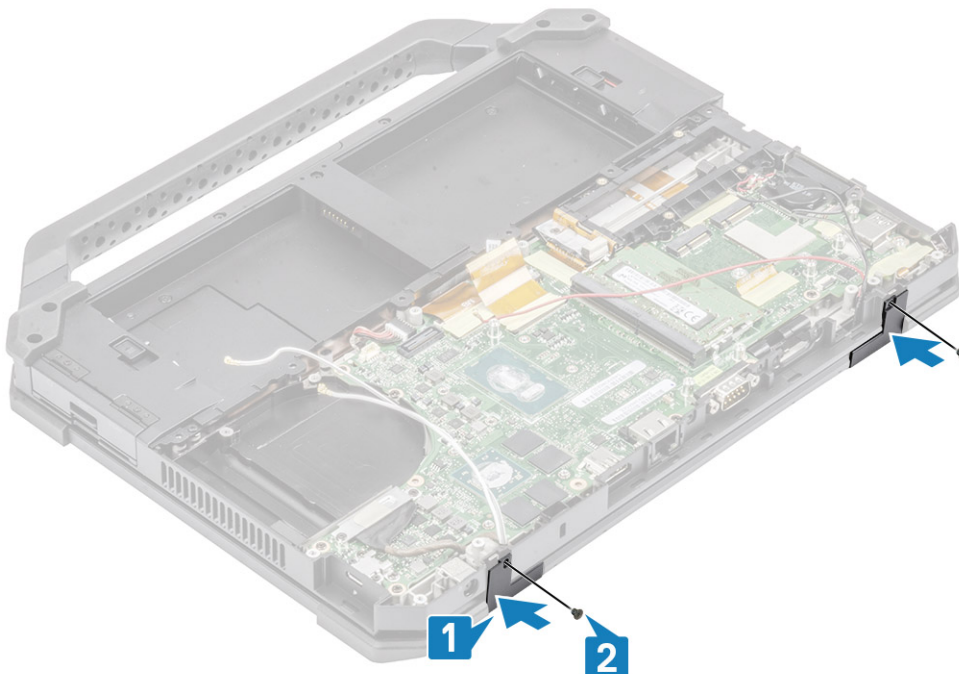
4. Install the:
   a. Heatsink
   b. Bottom chassis cover
   c. Batteries
5. Follow the procedure in After working inside your computer.

Display assembly

Removing the Display assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. PCIe heatsink assembly
   d. Docking port assembly
   e. WLAN card
   f. WWAN card
   g. GPS module
   h. Heatsink assembly
   i. Hinge covers
3. Remove the two 'M2*3' screws [1] on the EDP bracket, and turn it up side down [2].
4. ⚠ **CAUTION: The following epoxy screw locations will require additional focus. These screws are difficult to remove and there may be damage during the removal process. To prevent damage to the screws and surrounding plastics, please use the correct screwdriver for each screw type.**

   Pull and disconnect the EDP cable from the system board [3] and remove the two 'M2*3' epoxy screws [4] securing the hinges to base assembly [5].
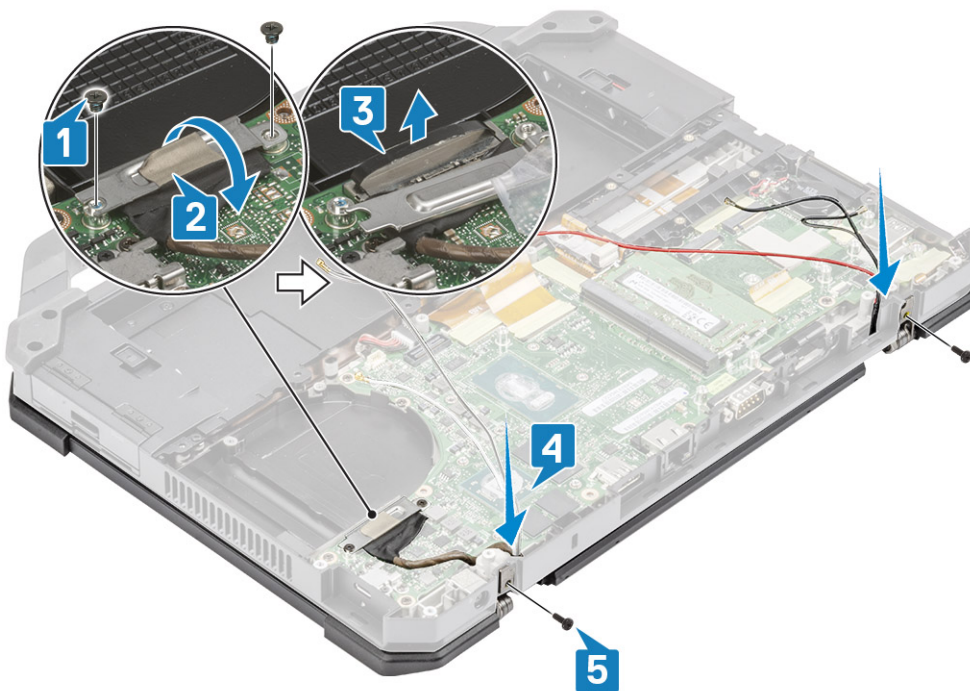
5. Open the LCD lid.

6. ⚠ **CAUTION: The following epoxy screw locations will require additional focus. These screws are difficult to remove and there may be damage during the removal process. To prevent damage to the screws and surrounding plastics, please use the correct screwdriver for each screw type.**

Loosen the two epoxy screws on hinges [1] and to separate the LCD assembly from the computer [2].

Installing the Display Assembly

1. Install the display assembly along the hinges at an obtuse angle [1] and install the two epoxy screws on left [2] and the right side [3].

2. Install the two 'M2*3' epoxy screws securing the hinges to base assembly [1] and rethread the antennae cables [2].
3. Connect the EDP cable [3] to the system board and place the EDP bracket over the cable [4].
4. Install the two 'M2*3' screws [5] and secure the EDP bracket to the system board.
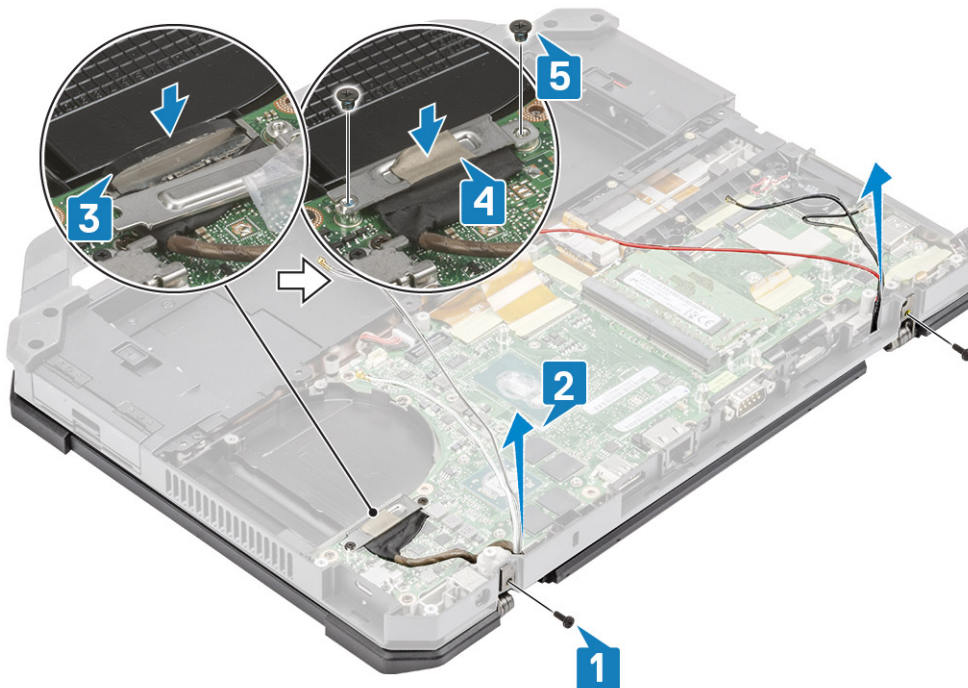
5. Install the:
   a. Hinge covers

b. Heatsink
   c. GPS card
   d. WLAN card
   e. WWAN card
   f. PCIe heatsink assembly
   g. Docking port assembly
   h. Bottom chassis cover
   i. Batteries
6. Follow the procedure in After working inside your computer.

LCD Bezel and Back Cover Assembly
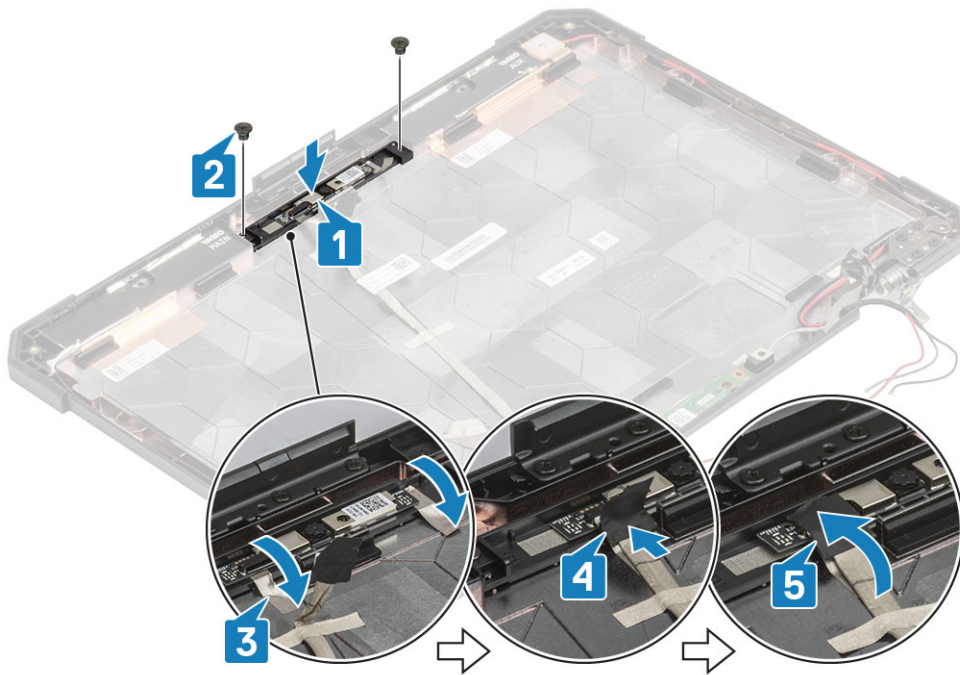
Removing the LCD with bezel and the display back cover assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. WLAN card
   d. WWAN card
   e. PCIe heatsink assembly
   f. Docking port assembly
   g. Heatsink
   h. Hinge covers
   i. Display assembly
3. Loosen the 12 'M2.5' screws from the back cover.

4. ⚠ **CAUTION: The following epoxy screw locations will require additional focus. These screws are difficult to remove and there may be damage during the removal process. To prevent damage to the screws and surrounding plastics, please use the correct screwdriver for each screw type.**

Remove the four 'M2.5' epoxy screws securing the bezel to the back cover [1] and pry at bottom edge to separate the two subassemblies [2].

5. Peel off the tape on the LCD connections [1] and open the connector [2] to disconnect the EDP cable [3] from the LCD.
6. Peel off the reflective tape [4] on the LCD panel and the touch connector [5] and disconnect the cable from the board [6].
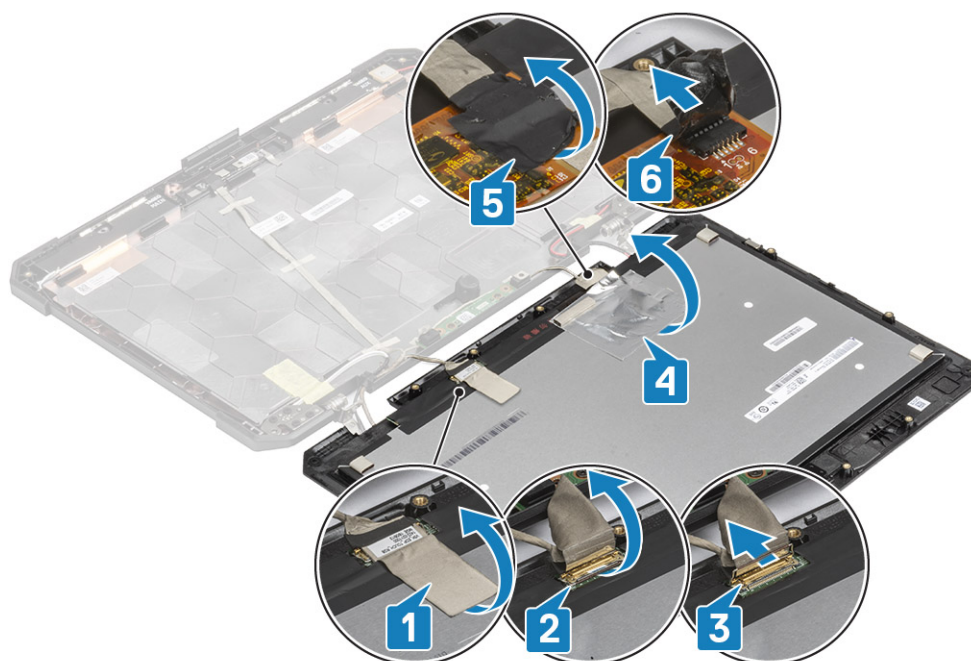
Installing the LCD with bezel and the display back cover assembly

1. Replace the EDP cable [1] on the LCD connector and close the actuator [2].
2. Secure the connector using a piece of tape [3] and adhere the reflective tape on the display panel [4] .
3. Connect the touch controller cable [5] and use insulation tape on the connector [6].
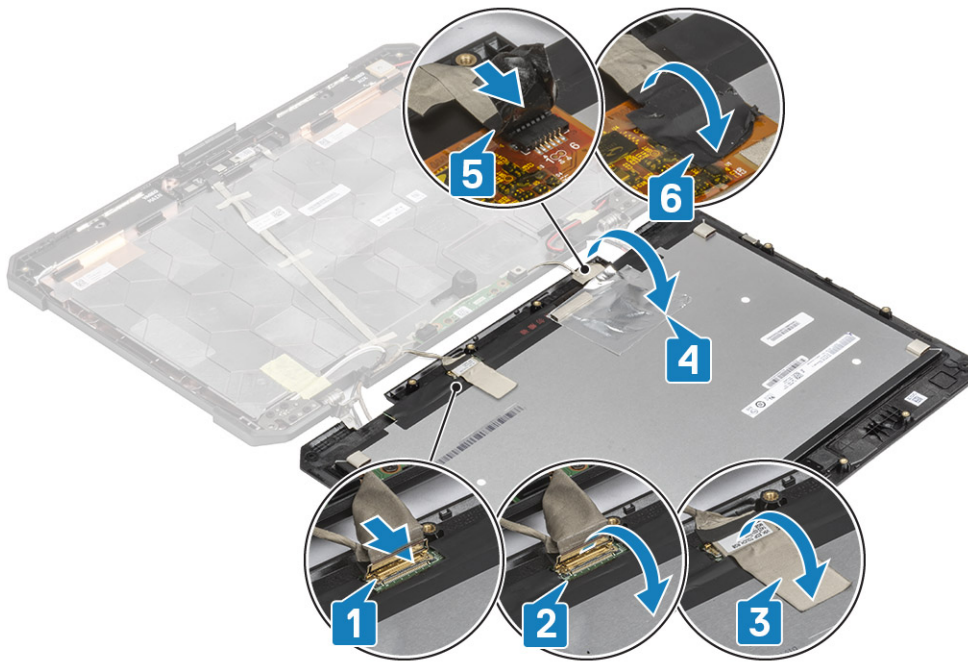
4. Align and place the bezel on the back cover [1] and secure it using the four M2.5 epoxy screws [2].

5. Install the 12 'M2.5' screws to secure the back cover to the LCD with bezel assembly.

6. Install the:
    a. Display assembly.
    b. Hinge covers
    c. Heatsink
    d. PCIe heatsink assembly
    e. Docking port assembly
    f. WWAN card
    g. WLAN card
    h. Bottom chassis cover
    i. Batteries
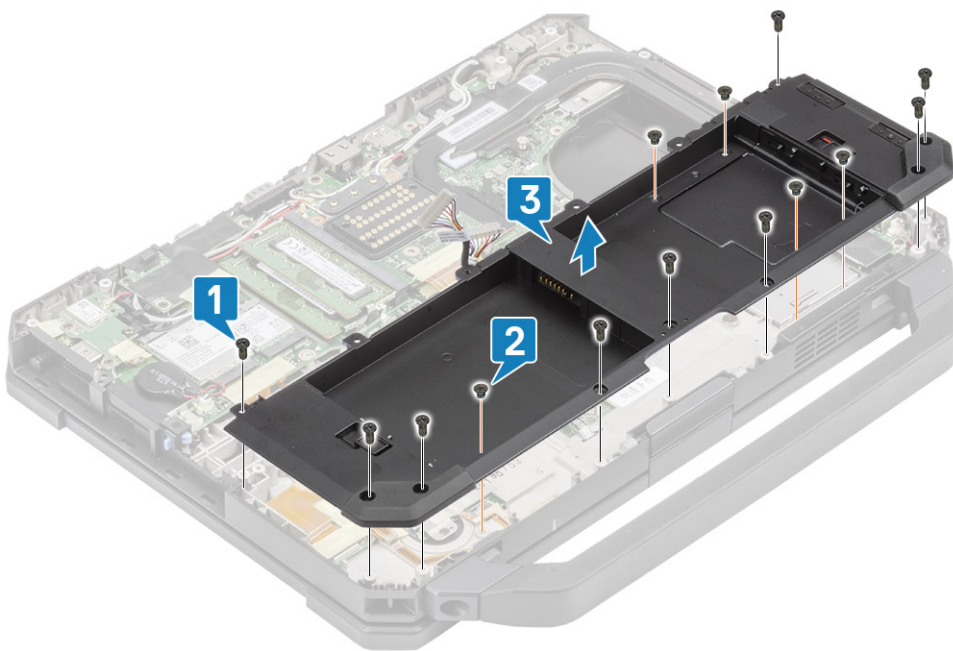7. Follow the procedure in After working inside your computer.

Microphone

Removing the Microphone

1. Follow the procedure in Before working inside your computer.
2. Remove the:
    a. Batteries
    b. Bottom chassis cover
    c. Memory
    d. WLAN card
    e. WWAN card
    f. PCIe heatsink assembly
    g. Docking port assembly
    h. Heatsink
    i. Hinge covers
    j. Display assembly.
    k. LCD bezel and back cover assembly.
3. Peel off the tape securing the microphone daughterboard[1] and remove the two 'M2*3' screws [2] to turn the daughterboard [3] up side down.
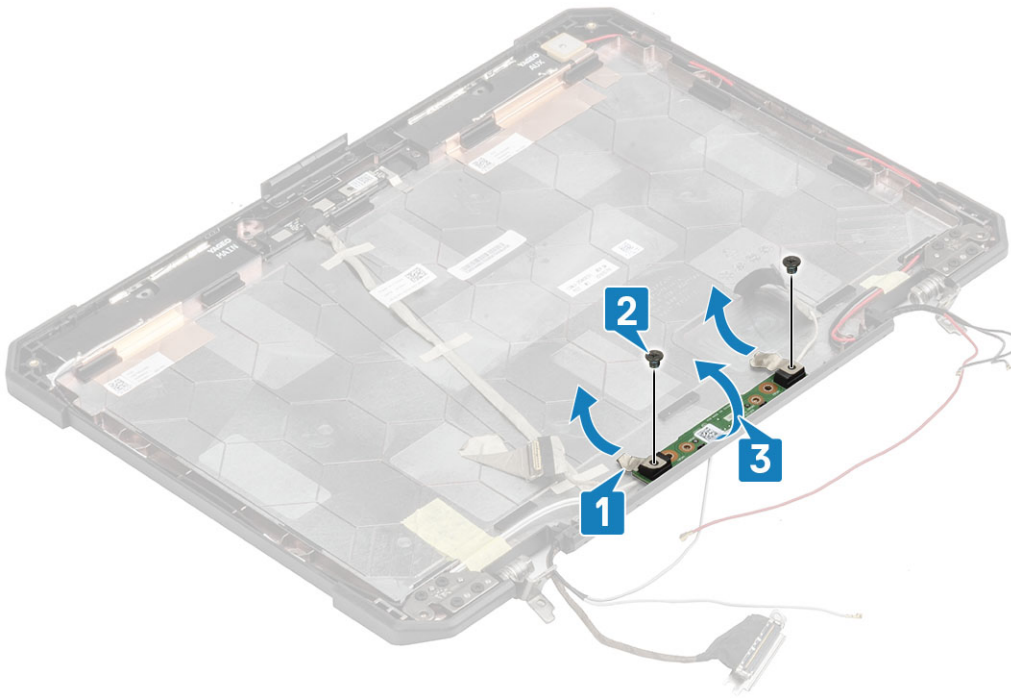
4. Peel off the insulation tape [1] and disconnect the EDP cable connectors [2].
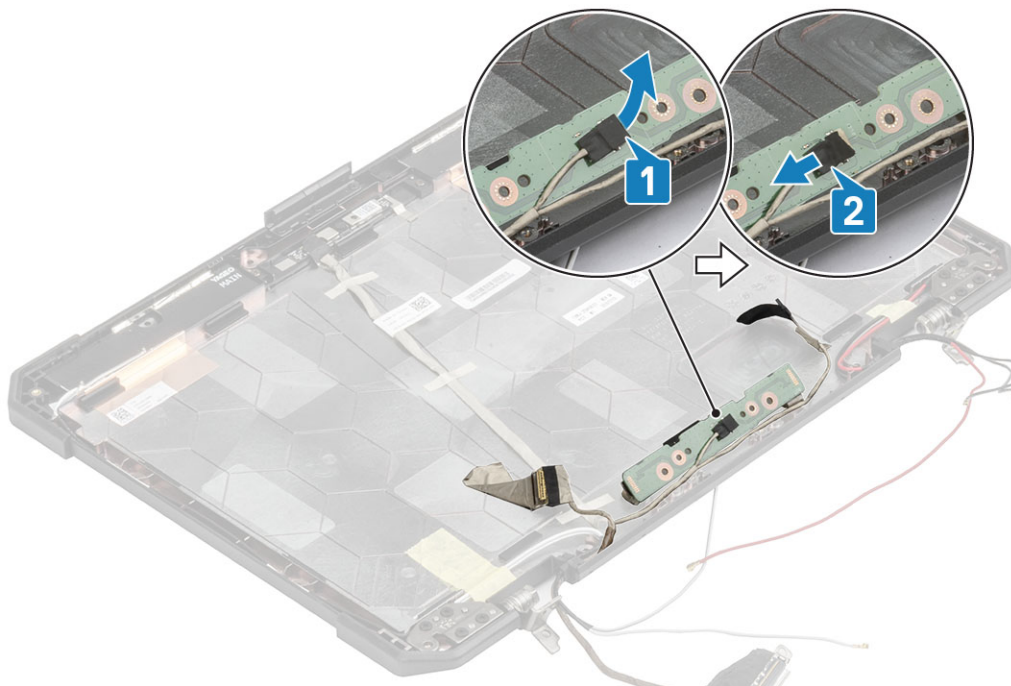
Installing the Microphone

1. Connect the EDP cable to the microphone daughterboard [1] and secure it using a piece of tape [2].
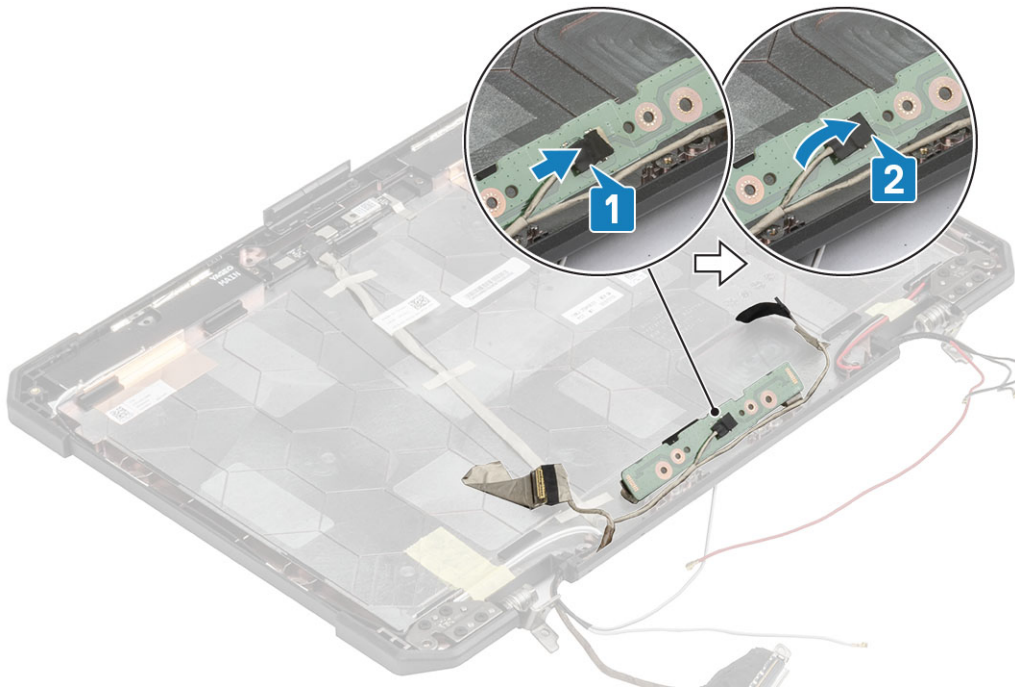
2. Turn over the microphone daughterboard on the back cover [1] and tighten the two 'M2*3' screws [2].

3. Secure the microphone daughterboard using a piece of reflective tape on either sides [3] to the LCD back cover.
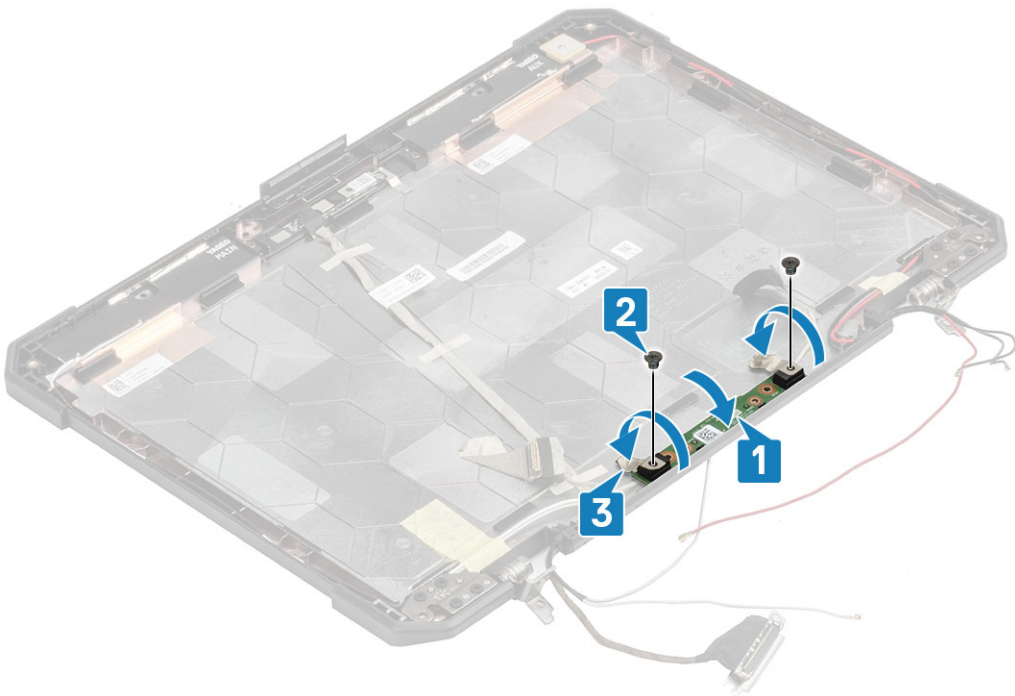
4. Install the:
    a. LCD with bezel assembly.
    b. Display assembly.
    c. Hinge covers
    d. Heatsink
    e. PCIe heatsink assembly
    f. Docking port assembly
    g. WWAN card
    h. WLAN card
    i. Bottom chassis cover
    j. Batteries

5. Follow the procedure in After working inside your computer.

Camera

Removing the Camera

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. Memory
   d. WLAN card
   e. WWAN card
   f. PCIe heatsink assembly
   g. Docking port assembly
   h. Heatsink
   i. Hinge covers
   j. Display assembly.
   k. LCD Bezel and back cover assembly.
3. Peel off the reflective tape[1] on camera module and the insulation tape securing the EDP cable[2] to camera module.
4. Disconnect the EDP cable from the camera module [3] and remove the two 'M2*3' screws [4].
5. Lift the camera module away from the back cover [5] to remove it from the computer.
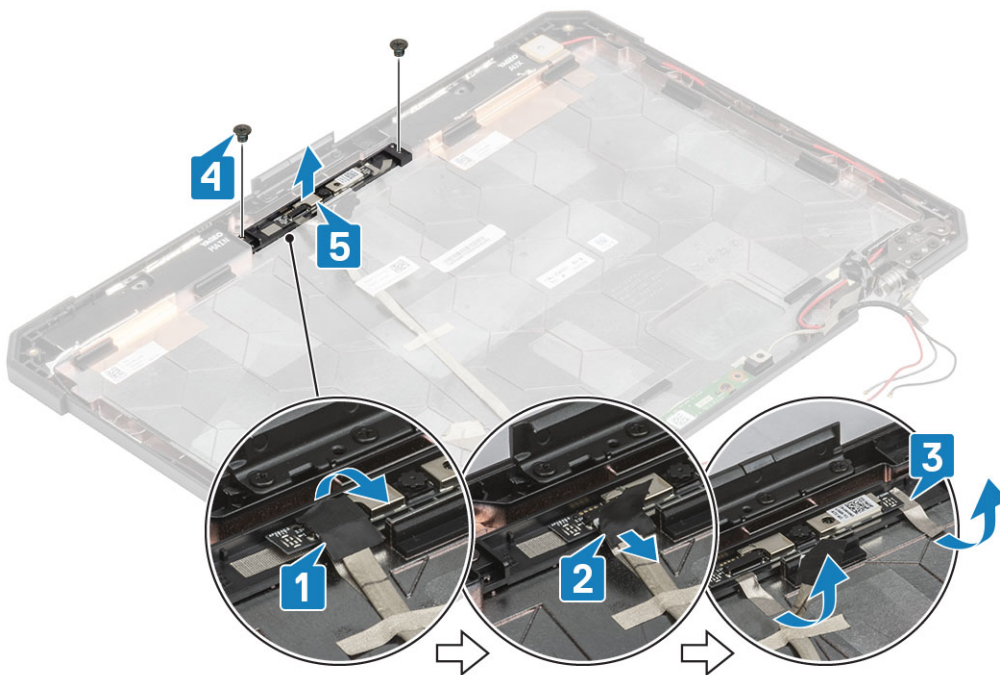
⚠ CAUTION: **Do not touch the Camera Lens fused to the LCD with bezel assembly.**

Installing the Camera

1. Install the camera module [1] on the back cover and install the two 'M2*3'. screws [2]
2. Connect the EDP cable to the camera module [3], stick a piece of insulation tape [4] on the EDP connectors.
3. Secure the camera module on the back cover using a piece of reflective tape [5].

4. Install the:
   a. LCD with bezel assembly
   b. Display assembly.
   c. Hinge covers
   d. Heatsink
   e. PCIe heatsink assembly
   f. Docking port assembly
   g. WWAN card
   h. WLAN card
   i. Bottom chassis cover
   j. Batteries
5. Follow the procedure in After working inside your computer.

Battery Bay

Removing the Battery bay

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. PCIe Heatsink assembly
3. ⚠ **CAUTION: Use extreme caution when removing cable due to the very limited space cable could be easily pinched or bent leading to cable damage.**

   Disconnect both the battery connections from the system board.
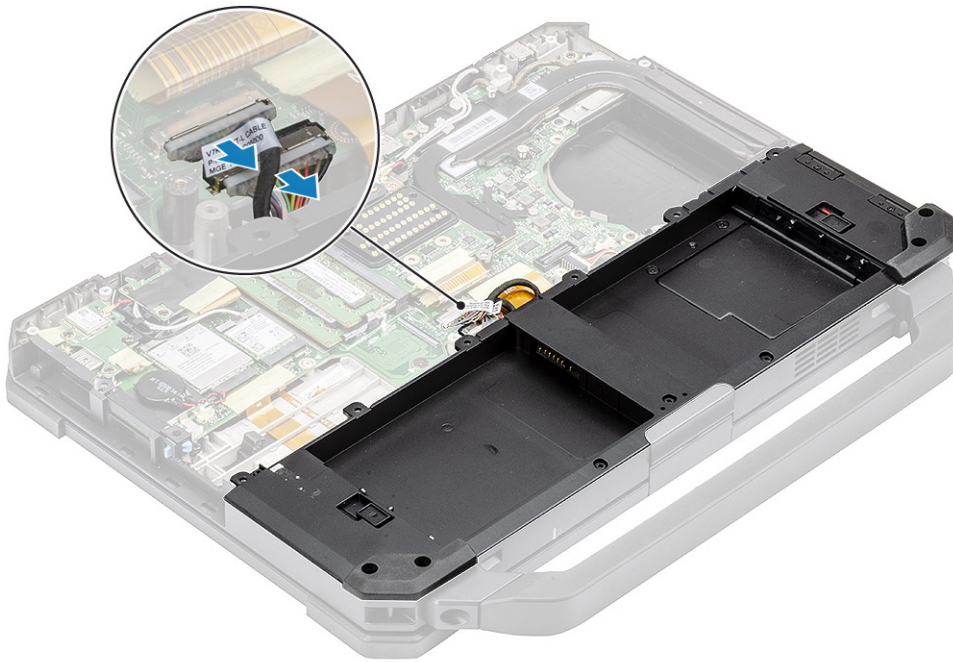
4. Remove the five 'M2.5*5' [1] and nine 'M2.5*3' [2] screws securing the battery bay to chassis and lift to separate the battery bay [3] from the computer.

Installing the Battery bay

1. Install the battery bay [1] on the computer and tighten the five 'M2.5*5' [2] and nine 'M2.5*3' [3] securing it to the chassis.
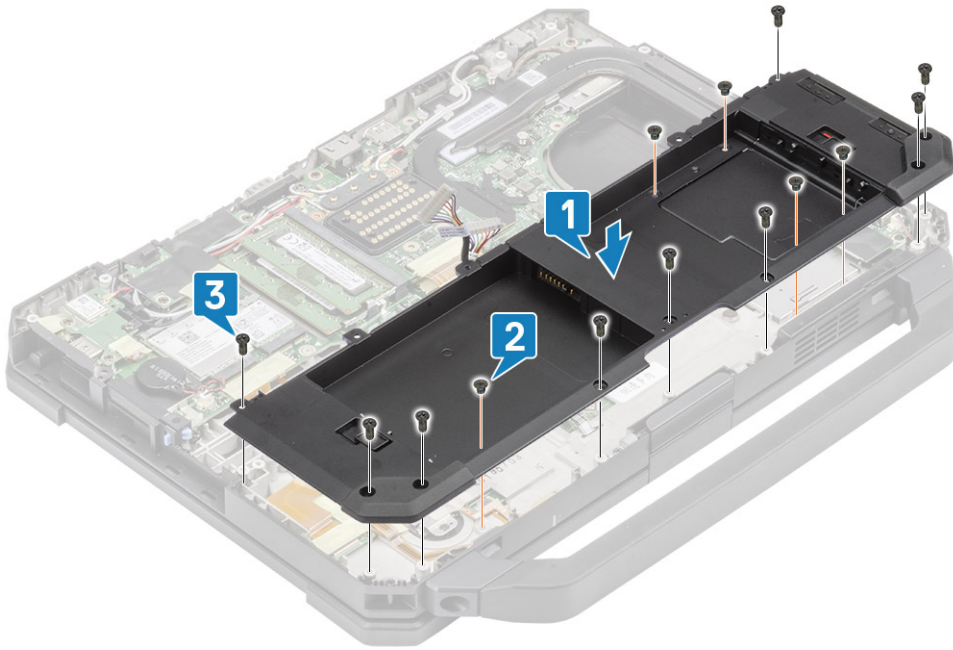
2. Connect the battery cables to the system board.
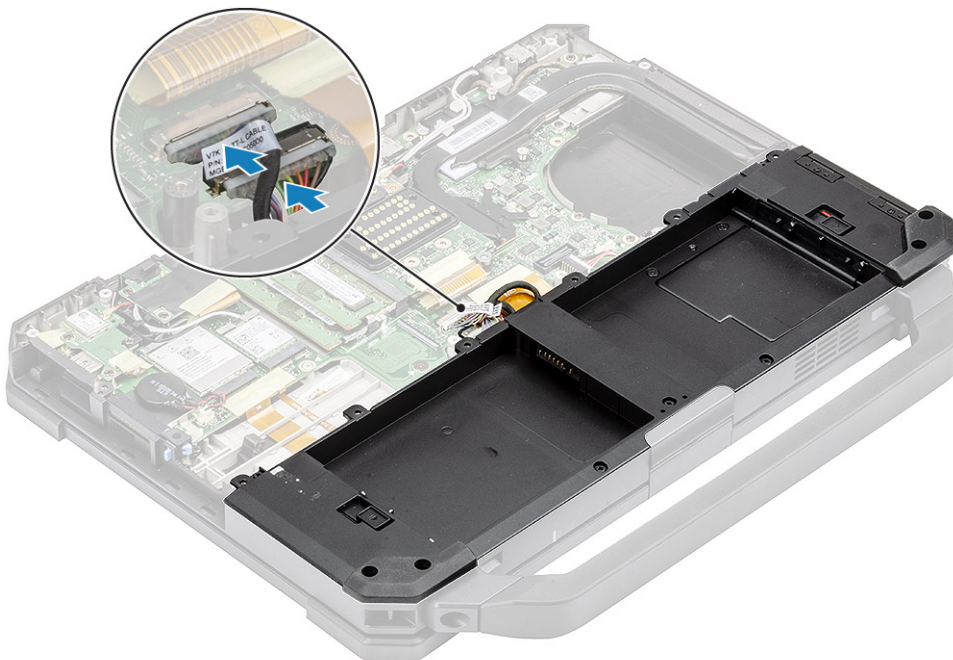
3. Install the:
    a. PCIe Heatsink assembly
    b. Batteries
    c. Bottom chassis cover
4. Follow the procedure in After working inside your computer.

Left I/O board

Removing the Left I/O daughterboard

1. Follow the procedure in Before working inside your computer.

2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. PCIe Heatsink fan assembly
   d. Battery bay
3. Peel off the tape [1], disconnect the left I/O daughterboard FPC connector [2] from the system board.
4. Disconnect the speaker cable from the left I/O daughterboard [3].
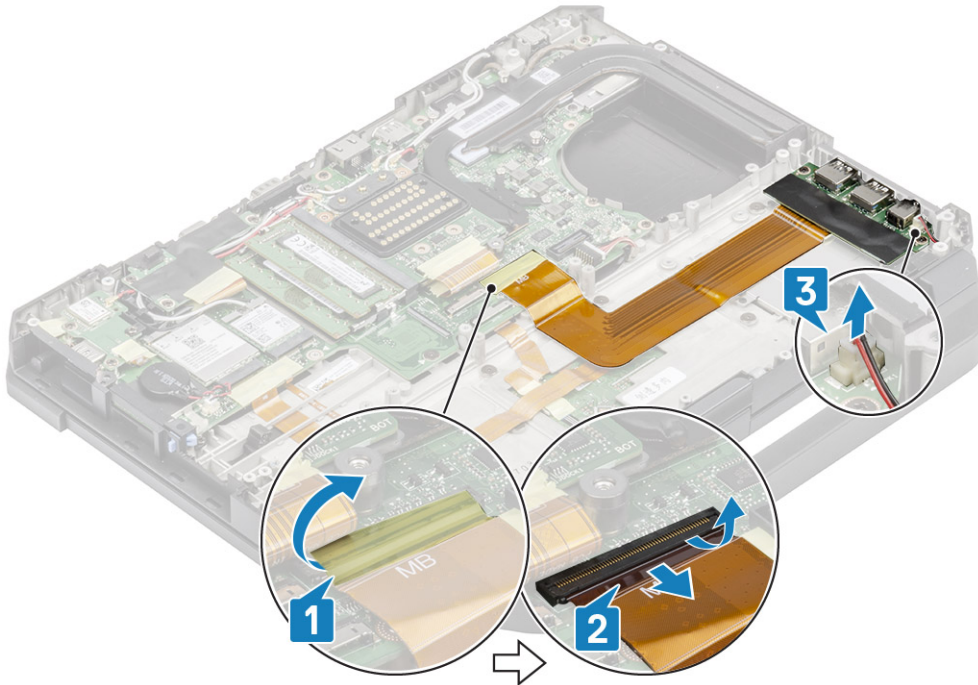
5. Loosen the two 'M2*5' screws [1] and lift the Left I/O daughterboard from the computer [2].
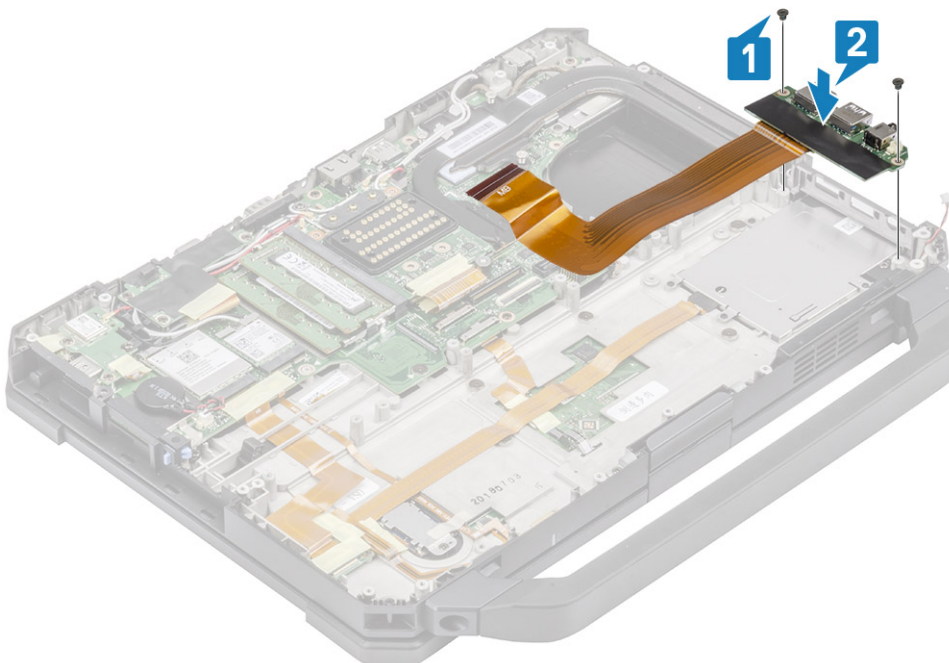
Installing the Left I/O Board

1. Install the left I/O daughterboard [1] and secure it using the two 'M2*3' screws [2] to the computer.
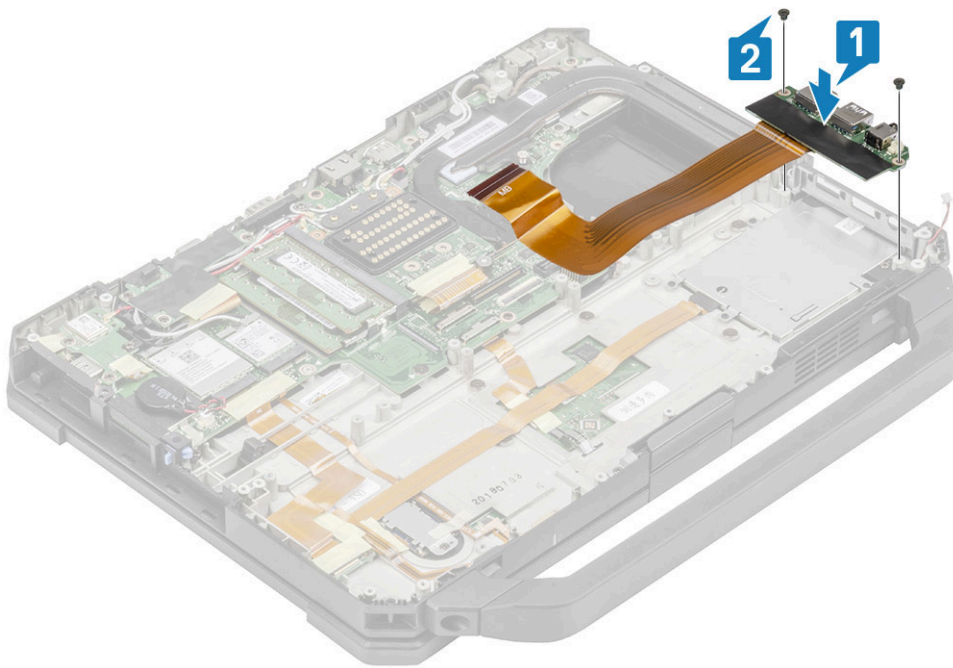
2. Connect the FPC to the system board [1] and secure it using a piece of insulation tape [2].
3. Connect the speaker cable to the left I/O daughterboard [3].
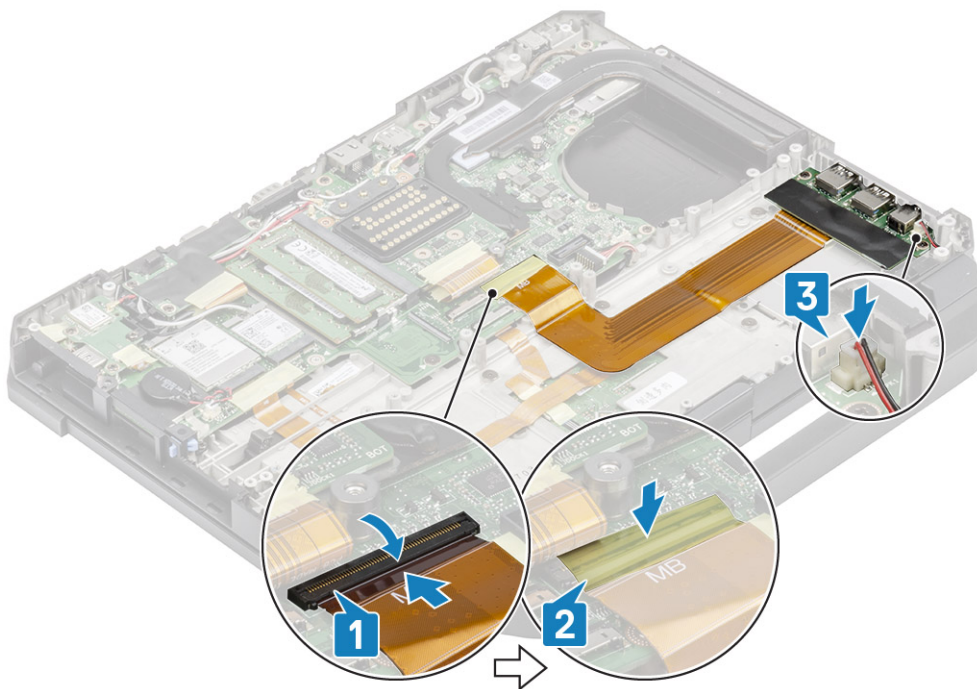
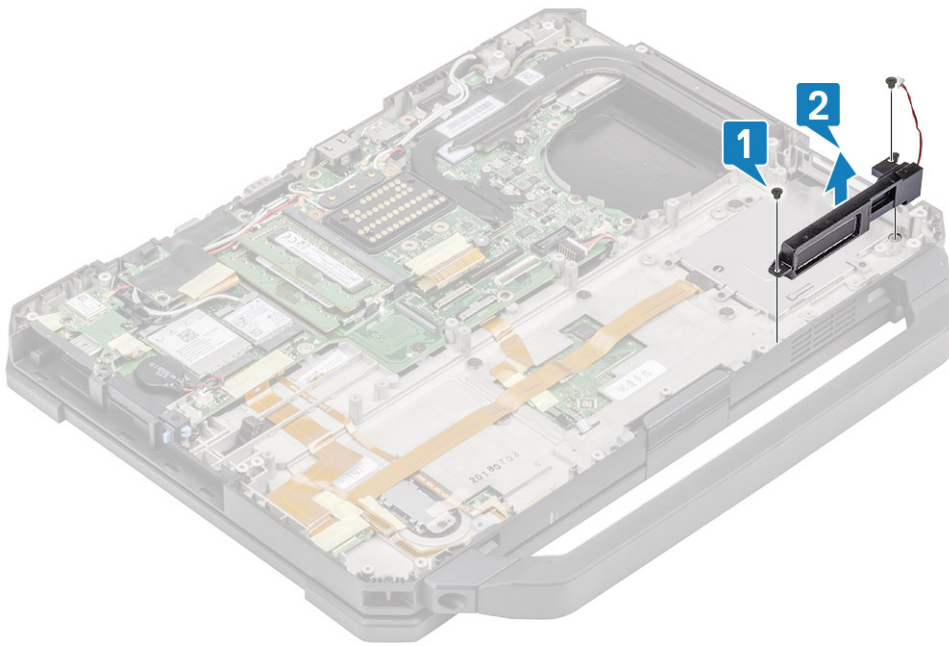4. Install the:
   a. Battery bay
   b. PCIe Heatsink fan assembly
   c. Bottom chassis cover
   d. Batteries
5. Follow the procedure in After working inside your computer.

Smart Card

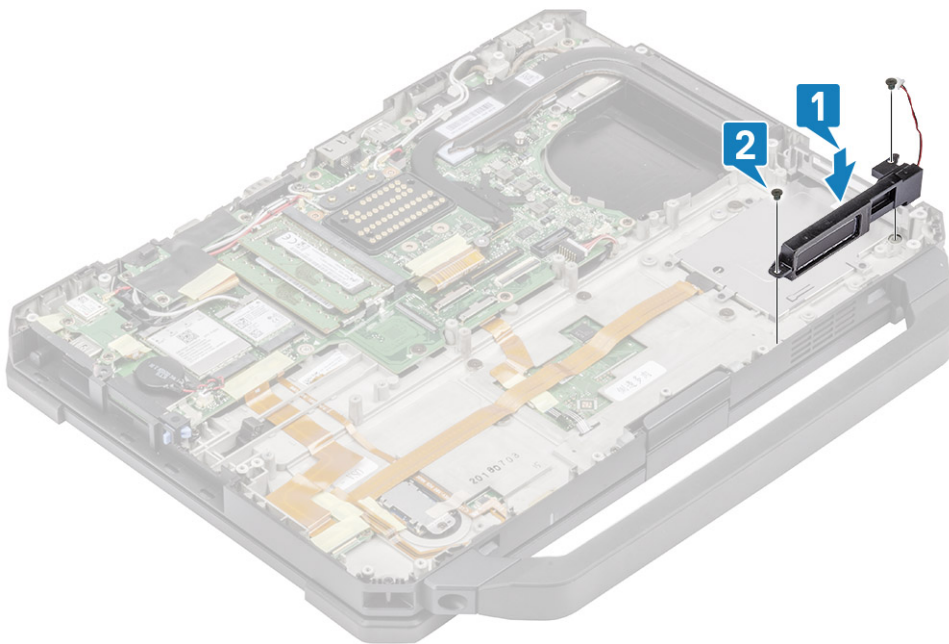## Removing the Smart Card Reader

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. PCIe heatsink assembly
   d. Battery bay
3. Remove the tape from the smart card reader connector[1] and disconnect it [2] from the USH board.
4. Remove the tape from the fingerprint reader connector [3] and disconnect it from the USH board [4].
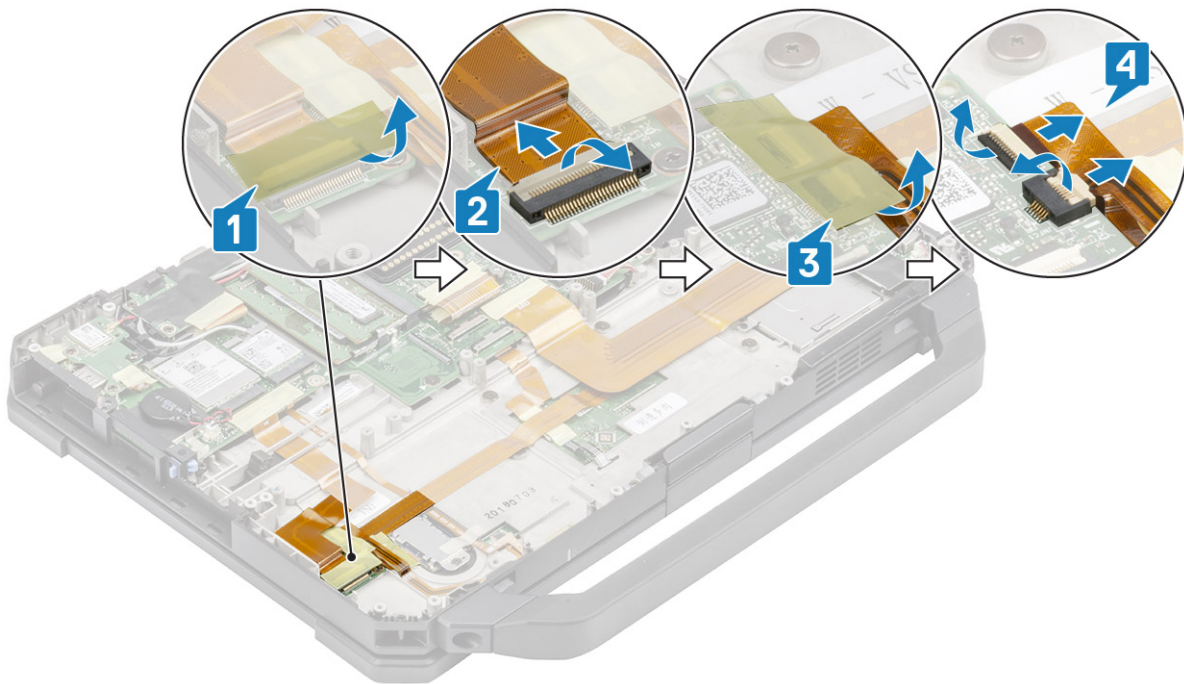
5. Remove the two 'M2*3' screws [1] securing the USH board to the bottom base and turn it up side down [2].
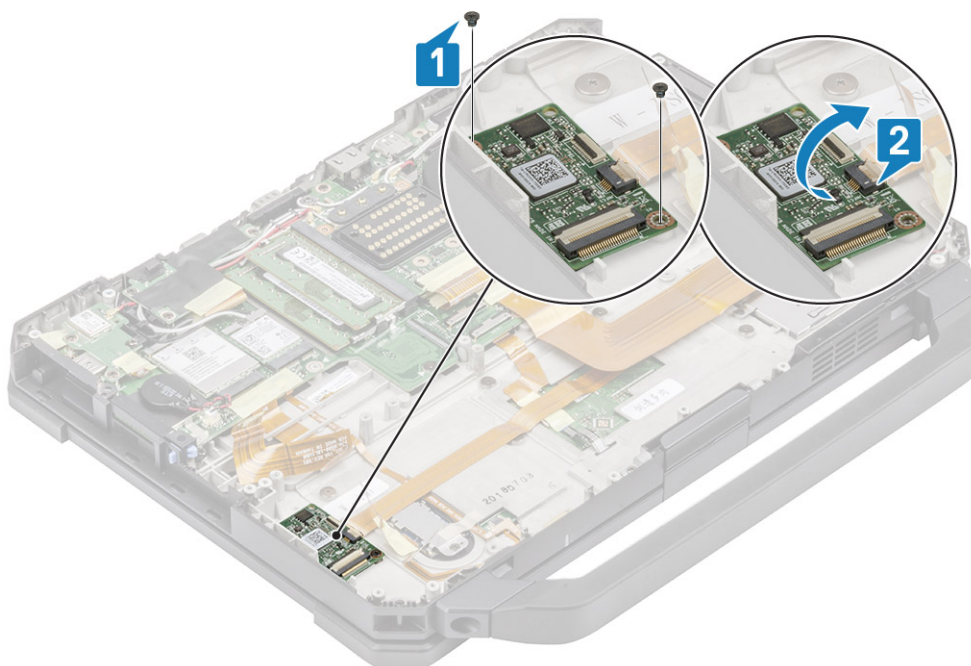
6. Remove the tape [1] and disconnect the Smartcard Reader FPC connector [2] from the USH board.
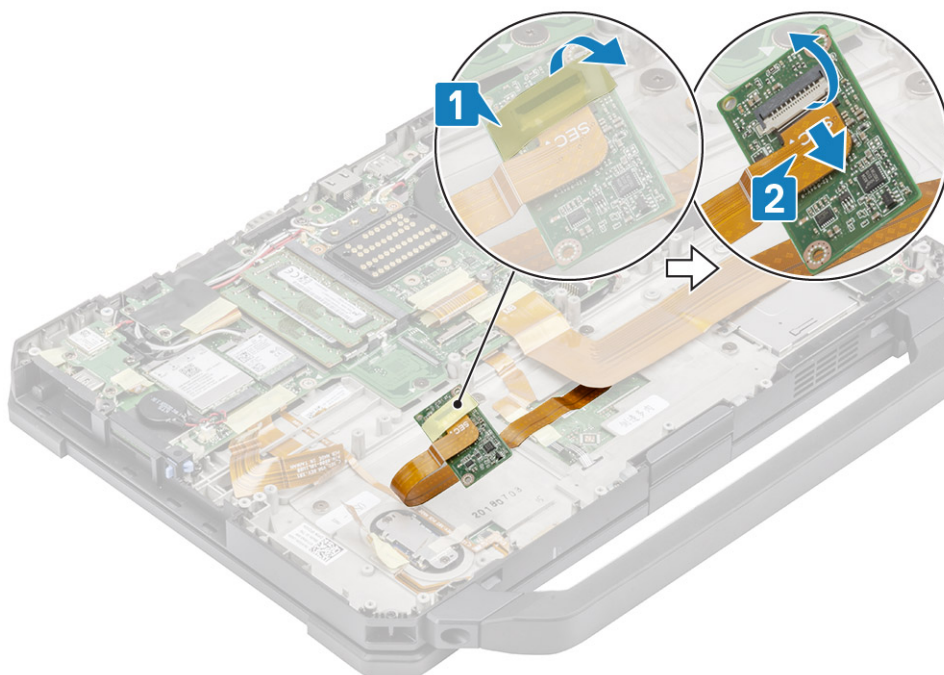
7. Loosen the four 'M2*3' screws [1] and remove the smart card [2] reader from the computer.
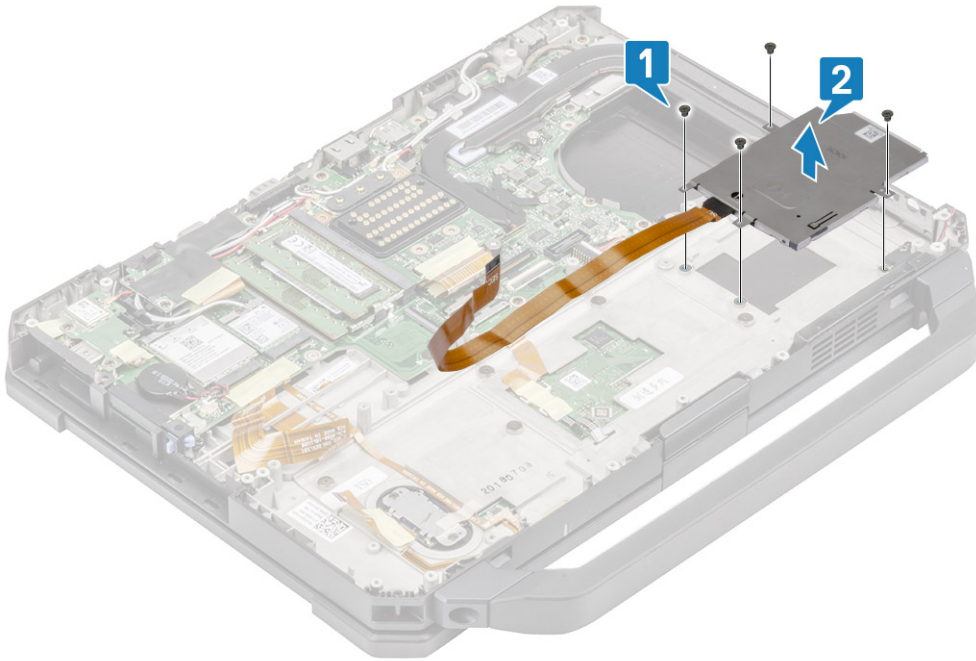
Installing the Smart Card Reader

1. Insert the smart card reader through the I/O face plate [1] and install the four 'M2*3' screws to secure it to the bottom chassis [2].
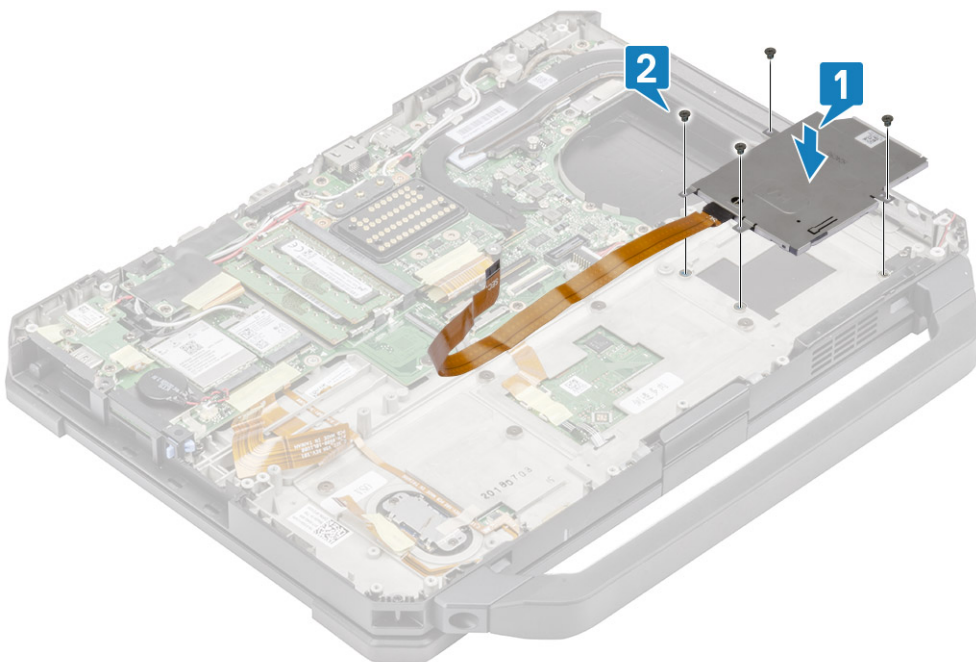
2. Connect the Smart Card FPC on the underside of the USH board [1] and secure it using a piece of tape [2].
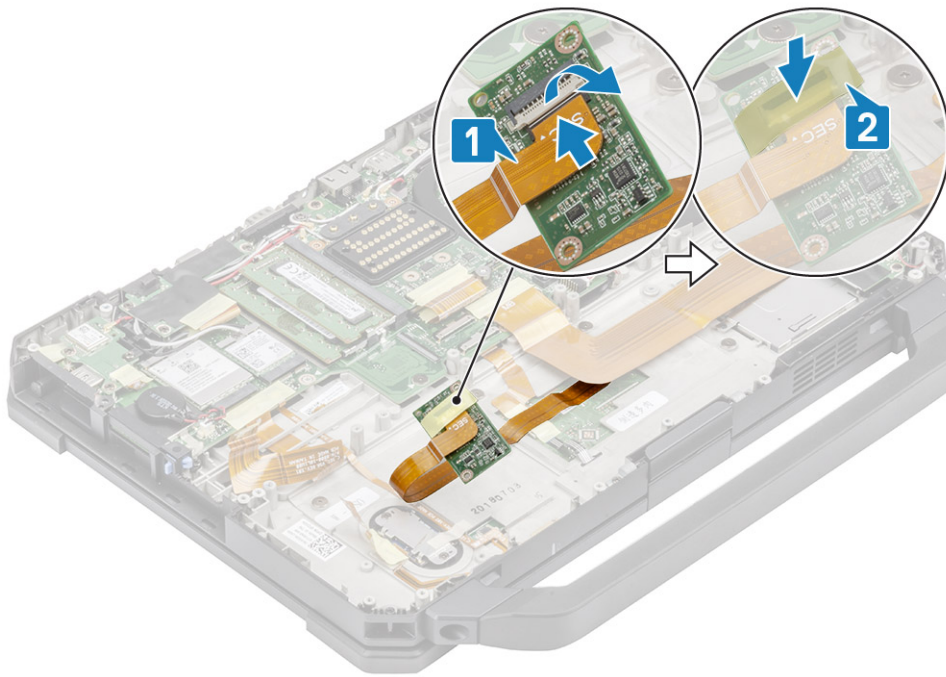
3. Install the two 'M2*3' screws [1] and turn over the USH board to secure it to the chassis [2].
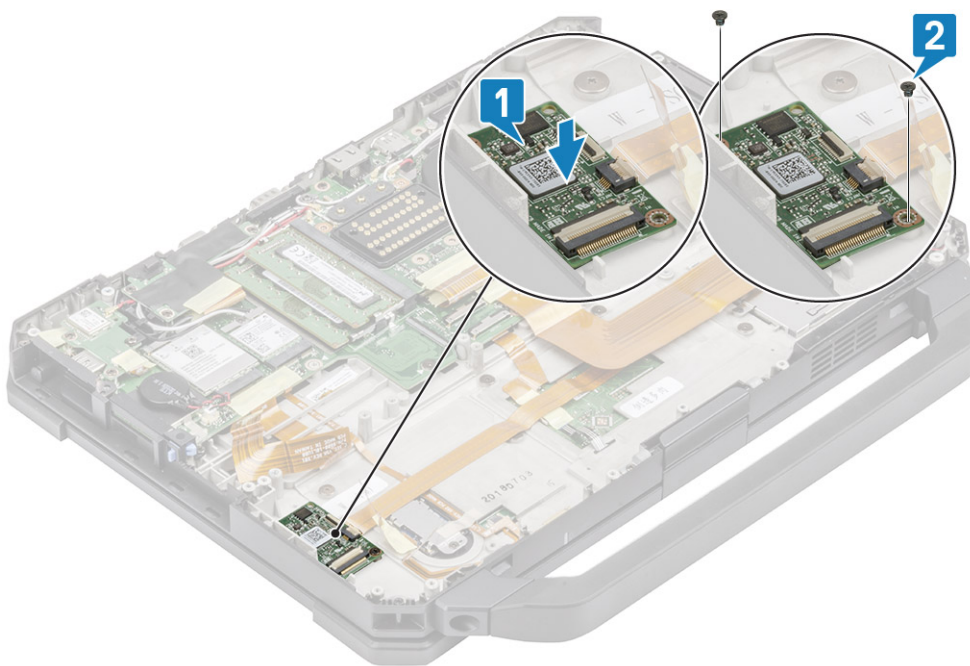
4. Connect the finger print reader connector [1] and secure it with a piece of tape [2].
5. Connect the smart card reader connector [3] to the USH board and secure it using a piece of tape [4].
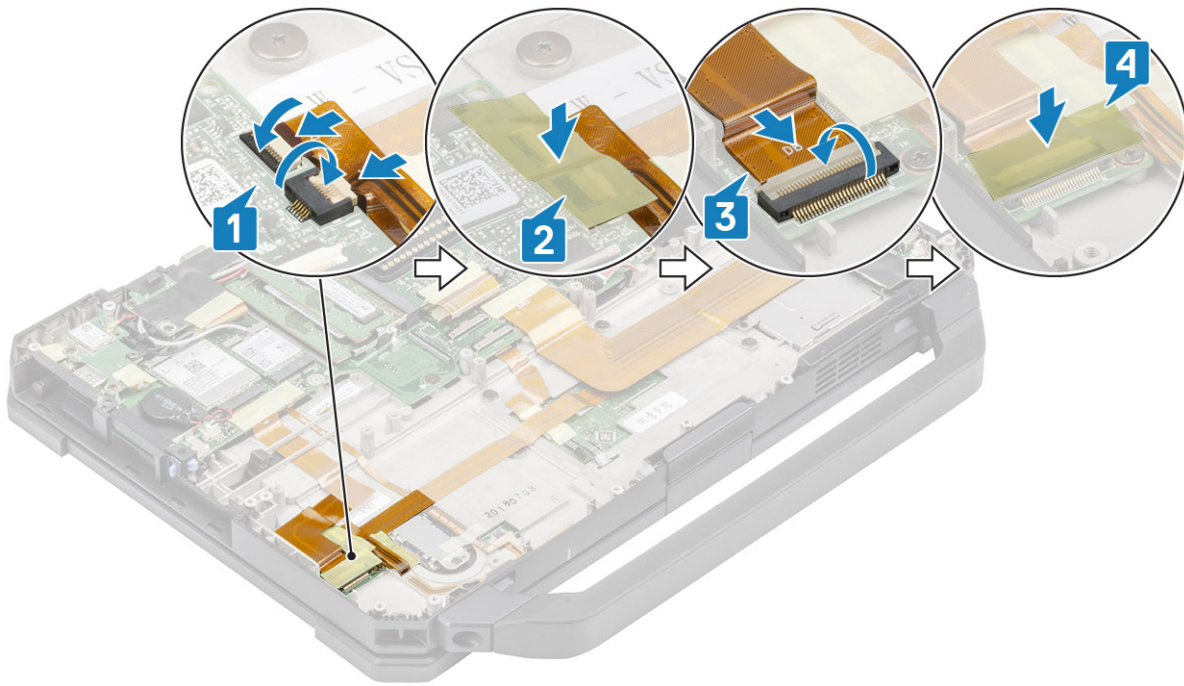
6. Install the:
   a. Battery bay
   b. PCIe Heatsink assembly
   c. Bottom chassis cover
   d. Batteries
7. Follow the procedure in After working inside your computer.

Speaker

Removing the Speaker

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. PCIe heatsink assembly
   d. Left I/O daughterboard
   e. Battery bay
3. Remove the two 'M2.5*7' screws [1] and remove the speaker from the computer [2].

Installing the Speaker

1. Align and place the speakers [1] on the computer and install the two 'M2.5*7' screws to secure the speaker to the base [2].

2. Install the:
   a. Battery Bay
   b. Left I/O daughterboard
   c. PCIe Heatsink assembly
   d. Docking port assembly
   e. Bottom Chassis Cover
   f. Batteries
3. Follow the procedure in After working inside your computer.

System board

Removing the System board

(i) **NOTE:** This system cannot be disassembled further. To access underlying components, replace the base assembly as per order details.

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. Batteries
   b. Bottom chassis cover
   c. Keyboard
   d. PCIe heatsink assembly
   e. Docking port assembly
   f. Primary SSD
   g. Heat Sink
   h. Memory
   i. WLAN card
   j. WWAN card
   k. GPS module
   l. Primary SSD rail
   m. Battery bay
   n. Rear I/O board
3. Peel off the tape [1] and disconnect the touch pad connector from the system board [2].
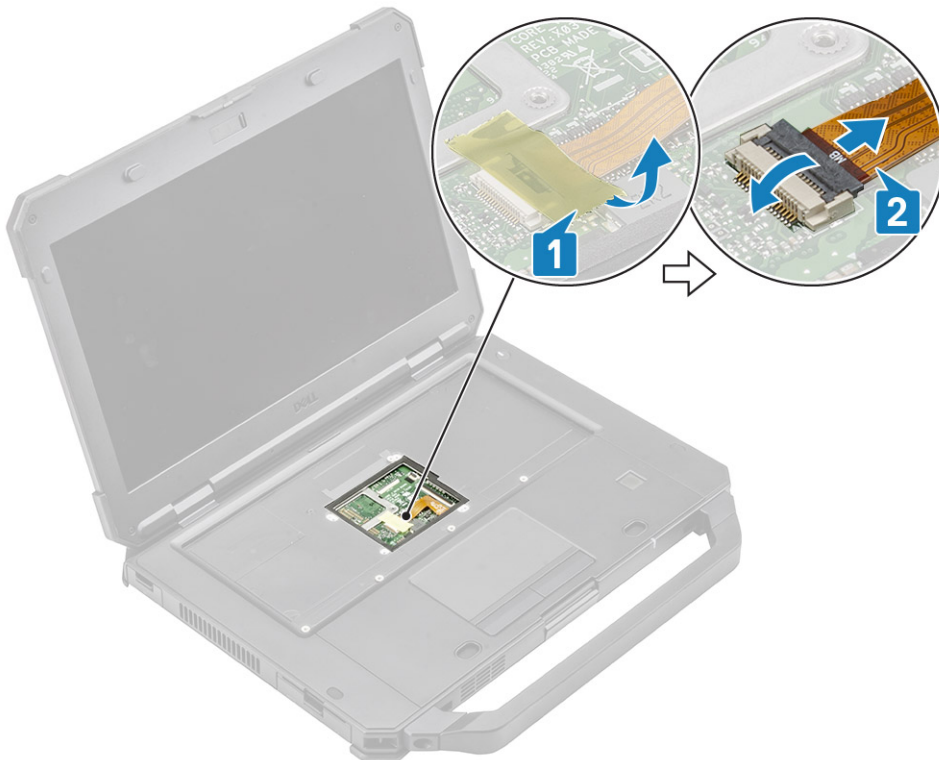
4. Peel off the tape [1] and remove the rear I/O board FPC cable [2] from the system board.
5. Peel off the tape [3] and remove the battery indicator LED cable [4] from the system board.
6. Peel off the tape [5] and remove the docking board FPC connector [6] from the system board.
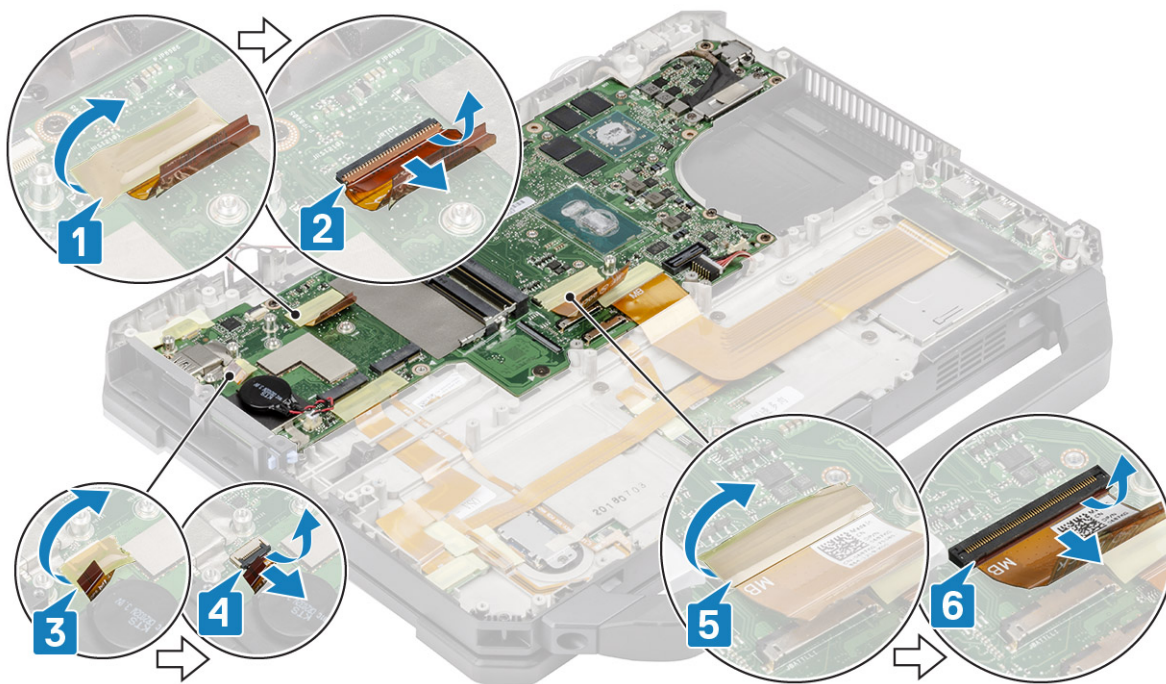
7. Peel off the tape [1] and disconnect the left I/O board FPC connector [2] from the system board.
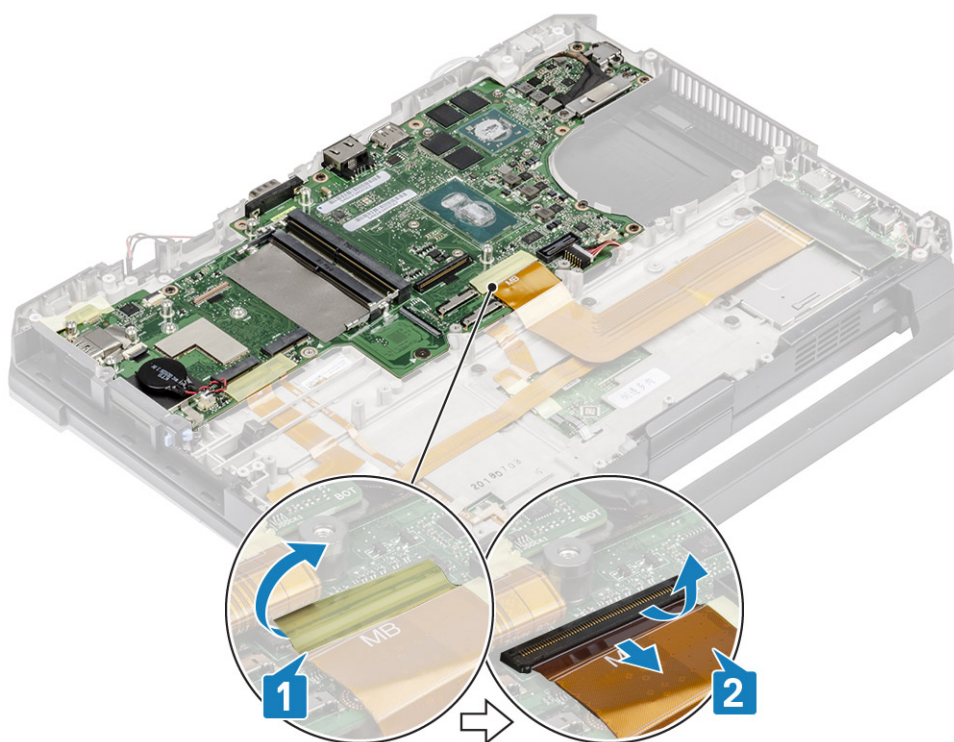
8. Peel off the tape [1] and disconnect the power button cable [2].
9. Peel off the tape [3] to disconnect the USH board and touch pad cable [4] from the system board.
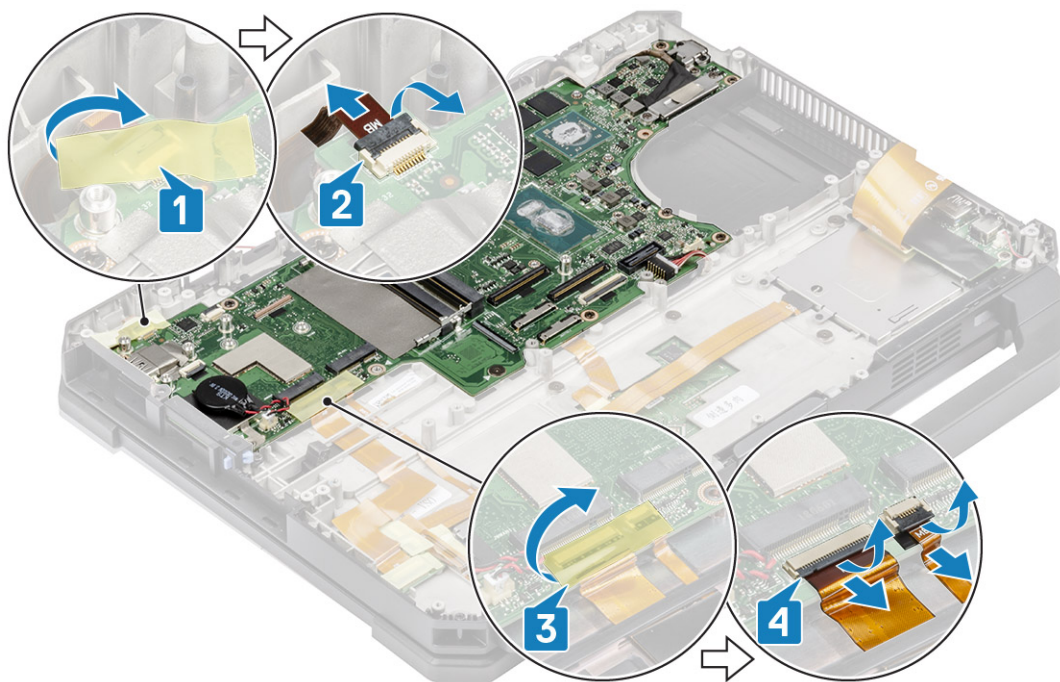
10. Remove the two 'M2*3' screws [1] and remove the EDP bracket [2] from the system board.
11. Remove the EDP cable using the black pull tag [3] and disconnect the DC-in cable [4] from the system board.
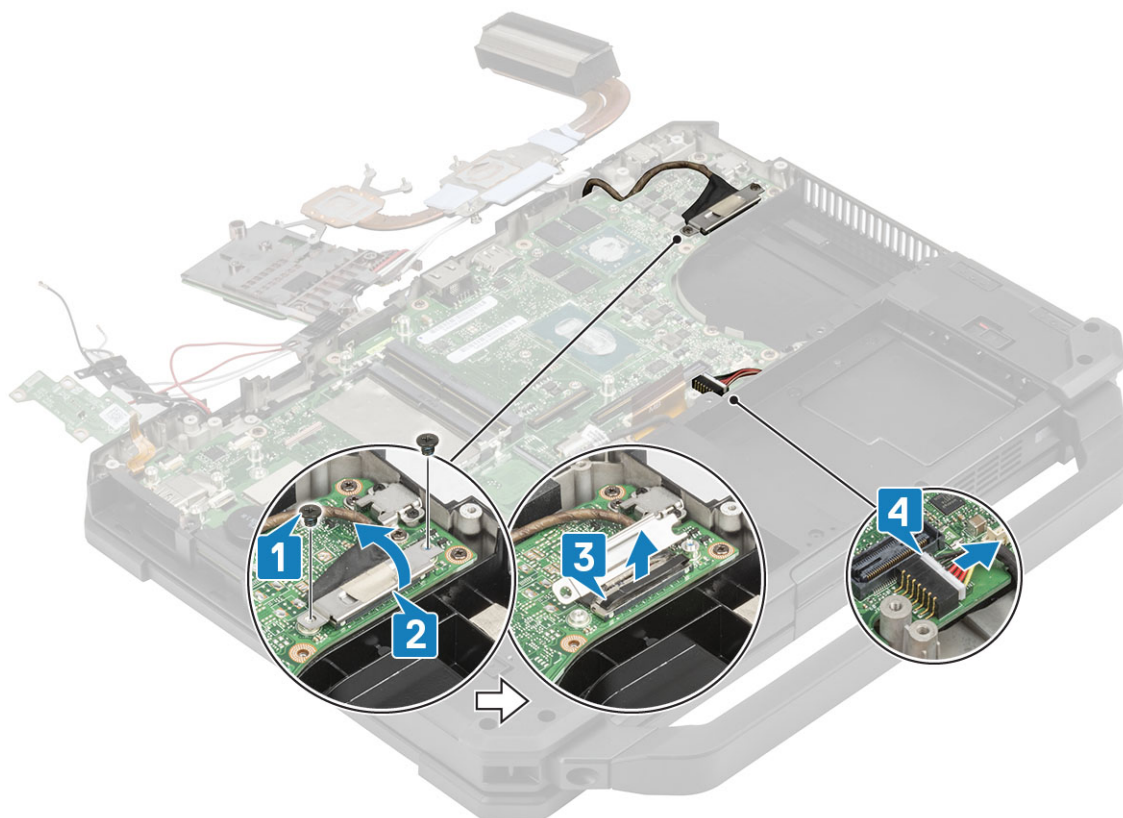
12. ⚠ **CAUTION: The following epoxy screw locations will require additional focus. These screws are difficult to remove and there may be damage during the removal process. To prevent damage to the screws and surrounding plastics, please use the correct screwdriver for each screw type.**

   Remove the two epoxy cap screws in the rear I/O space [1].
13. Remove the two 'M2.5*5' screws and two 'M1.6*3.0' screws [2] to remove the USB Type-C bracket [3] from the system board.
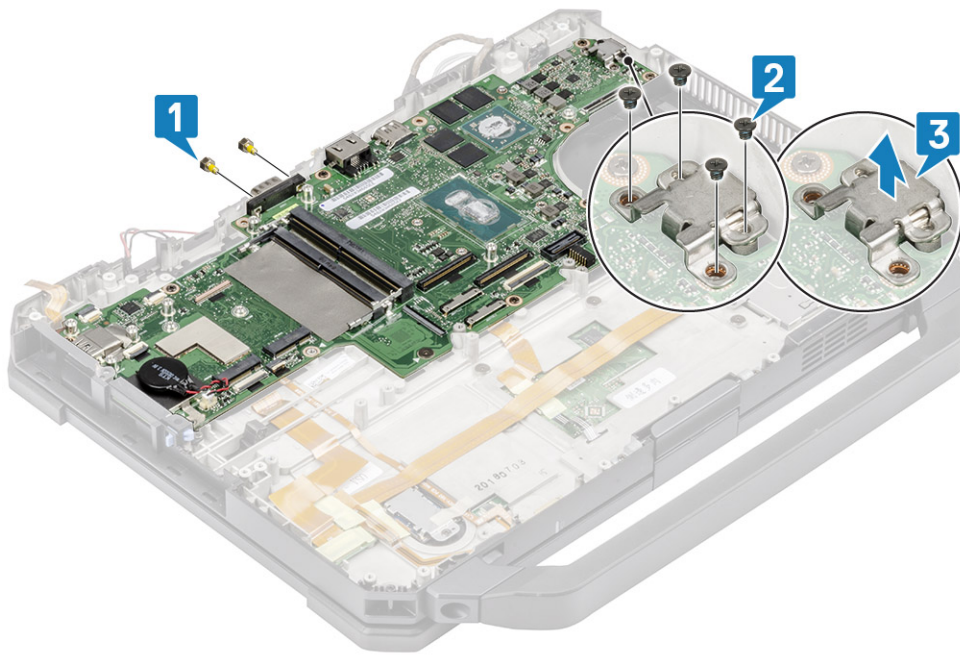
14. Remove the eight 'M2.5*5' screws [1] and single 'M2*3' screw [2] on the system board and remove the system board from the chassis [3].
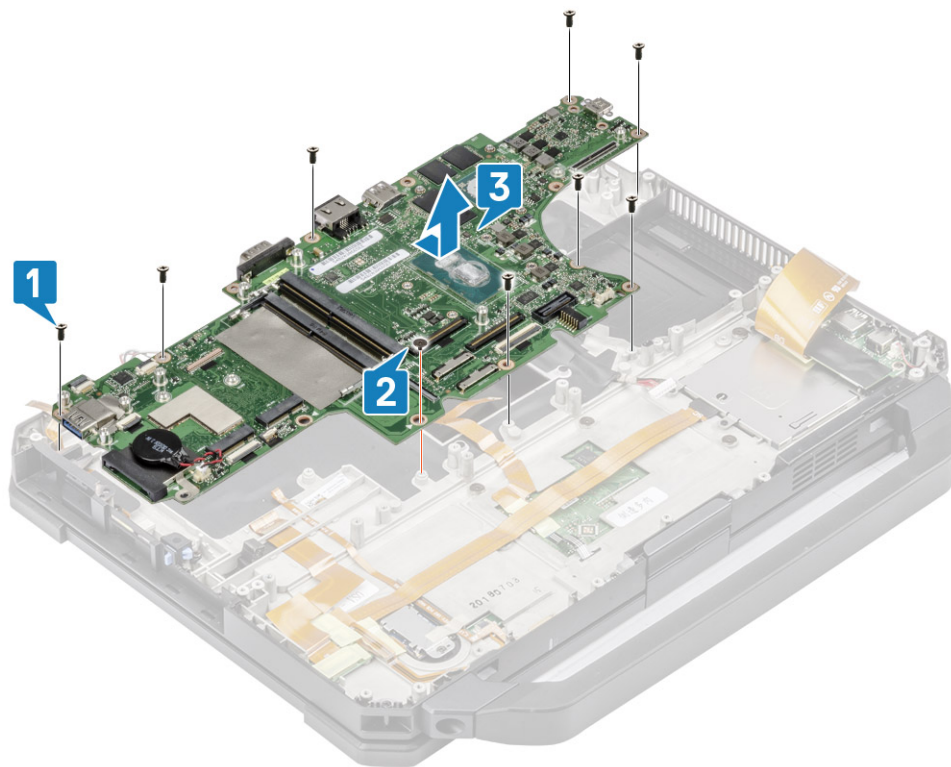
Installing the System board

1. Install the system board inserting the serial port on the system board through chassis [1] and install the eight 'M2.5*5' screws [2] and single 'M2*3' screw [3] on the system board.
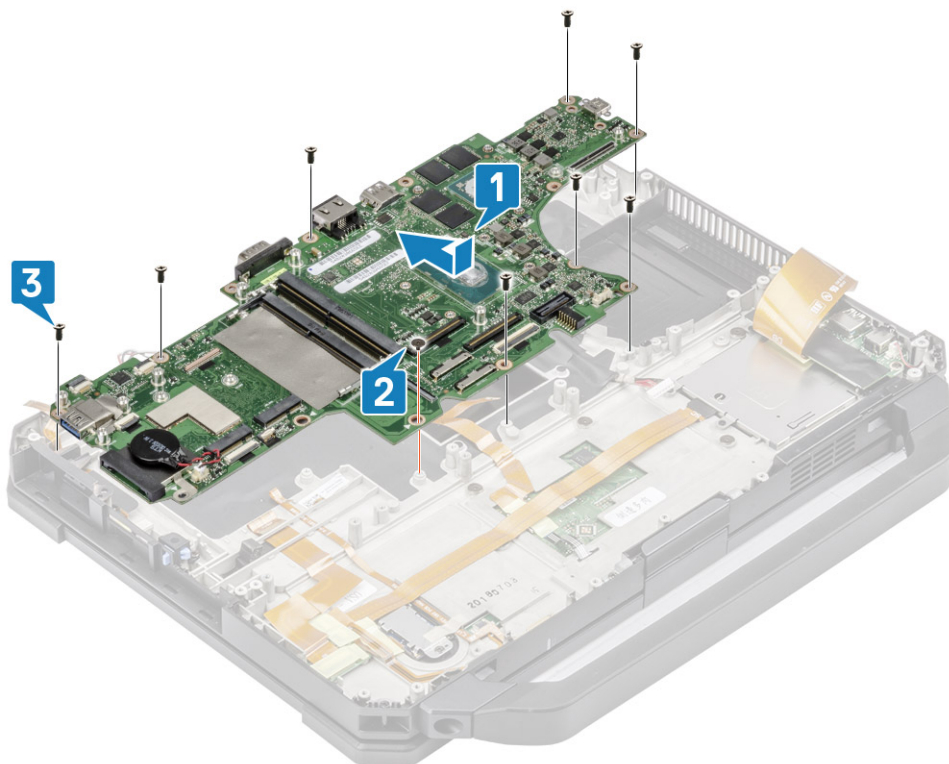
2. Install the two epoxy cap screws on the serial port of the system board [1].

3. ⓘ **NOTE:** When installing the System Board, technicians must ensure that both the battery cables (1st & 2nd Battery) and FPC cables (Left I/O FPC and Express Card reader FPC) are not pinched under the System Board.

   Install the USB Type-C bracket [2] and secure it with two 'M2.5*5' screws and two 'M1.6*3.0' screws on the system board [3].
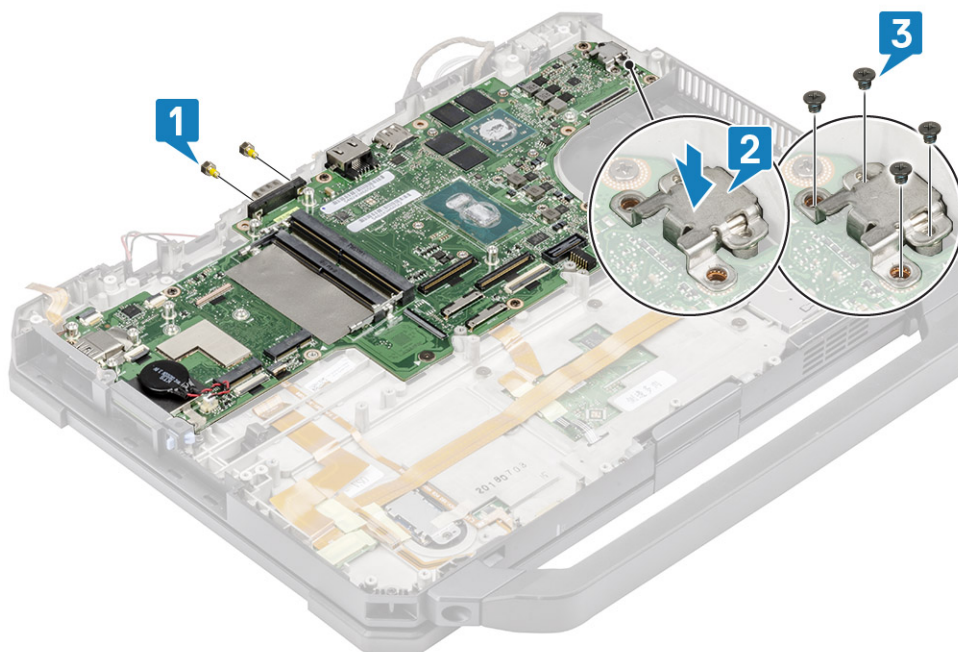

4. Install the EDP cable [1] and place the metal bracket [2] over the EDP connector on the system board.
5. Install the two 'M2*3' screws [3] securing it to the system board and connect the DC-in cable [4] to the system board.
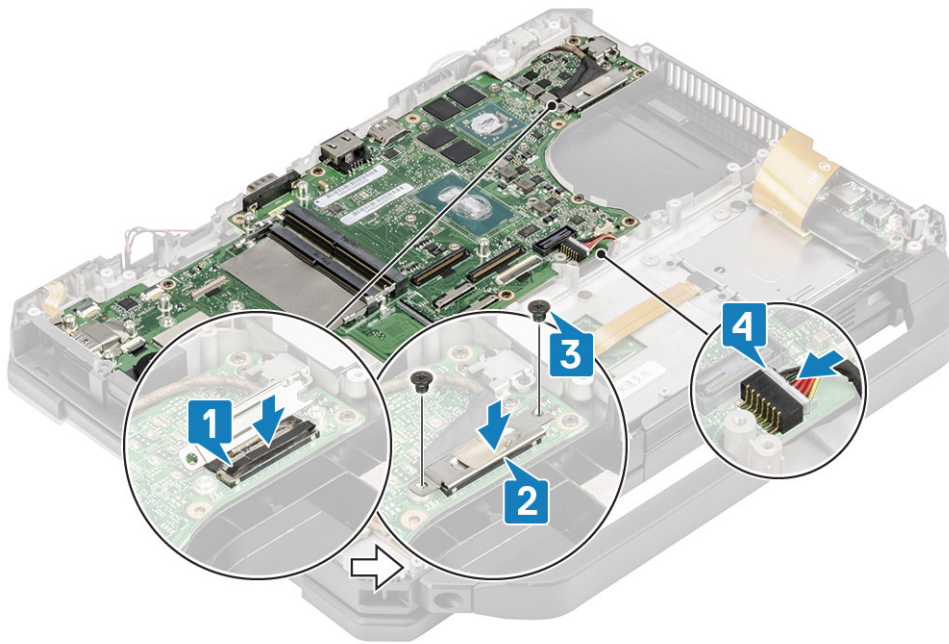
6. Connect the power button cable [1] and secure it using a piece of tape [2].
7. Connect the USH board and touch pad cables [3] to the system board and secure it using a piece of tape [4].
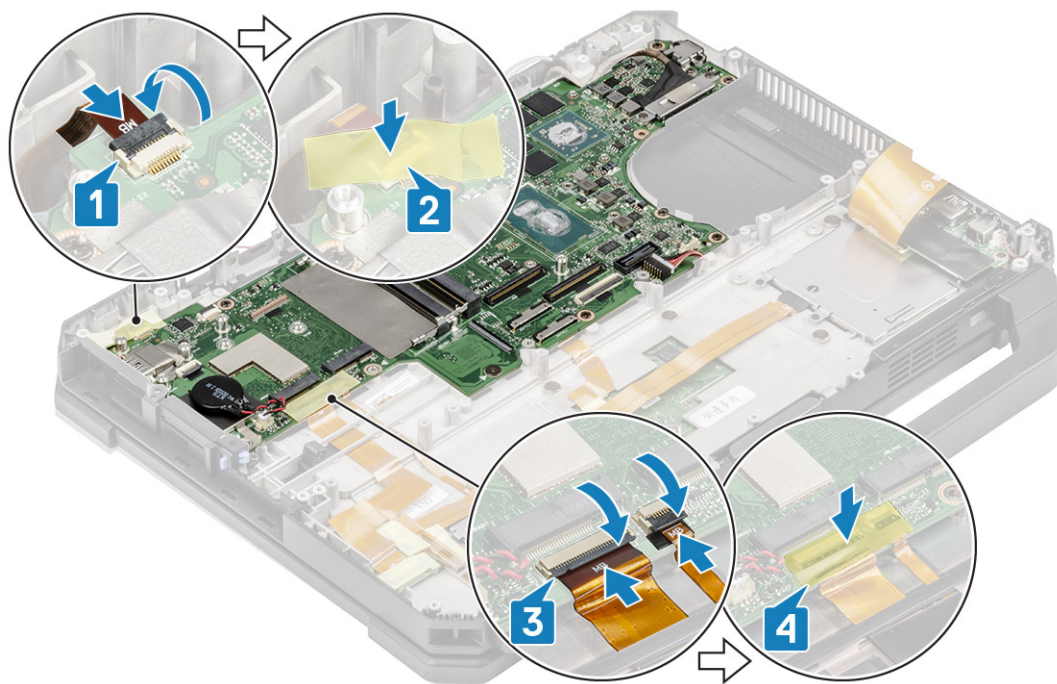

8. Connect the left I/O board FPC cable [1] and secure it using a piece of tape [2].
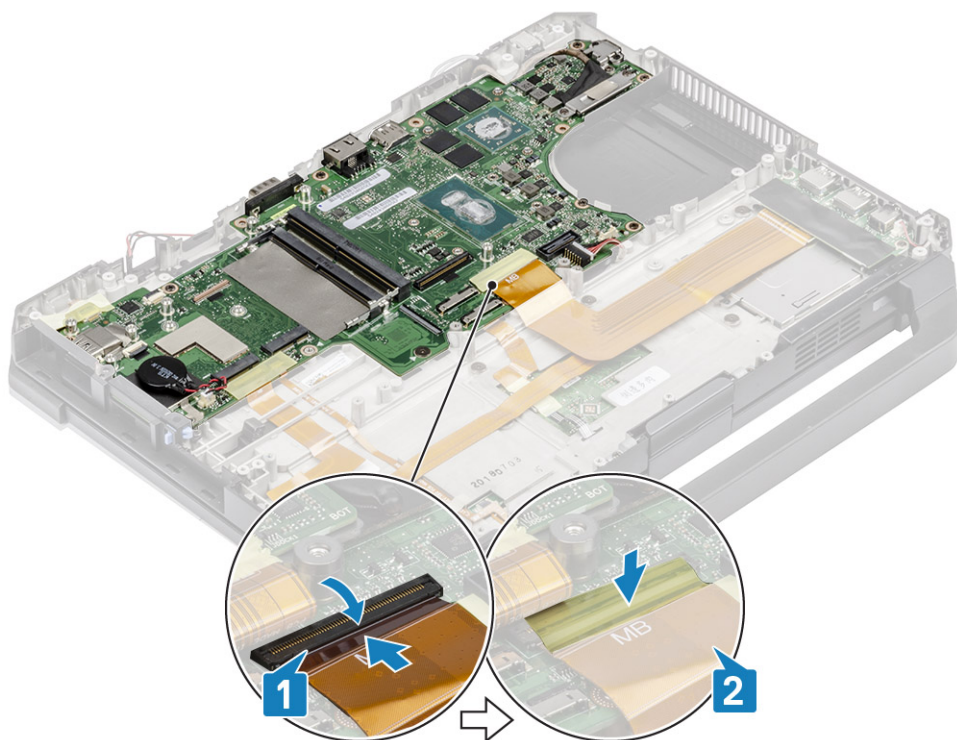
9. Connect the rear I/O board FPC cable [1] and secure it using a piece of tape [2].
10. Connect the battery indicator LED cable [3] and secure it using a piece of tape [4].
11. Connect the dock FPC connector [5] and secure it using a piece of tape [6].
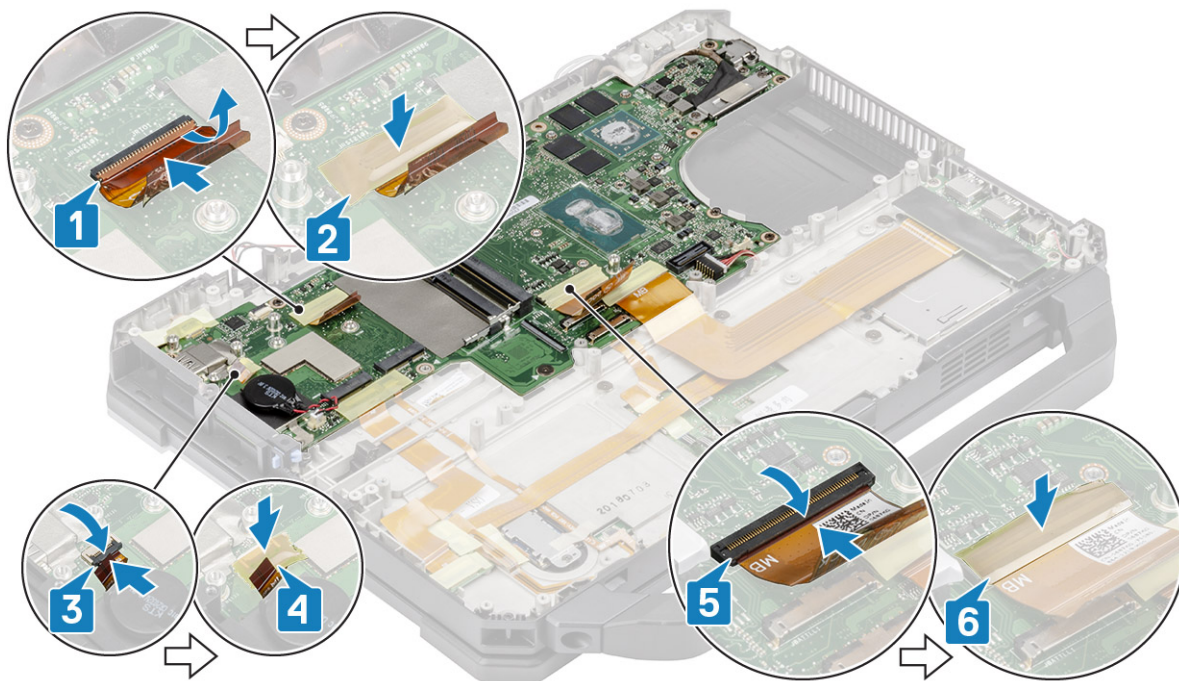
12. Connect the touch pad connectors to the system board [1] and secure it using a piece of tape [2].
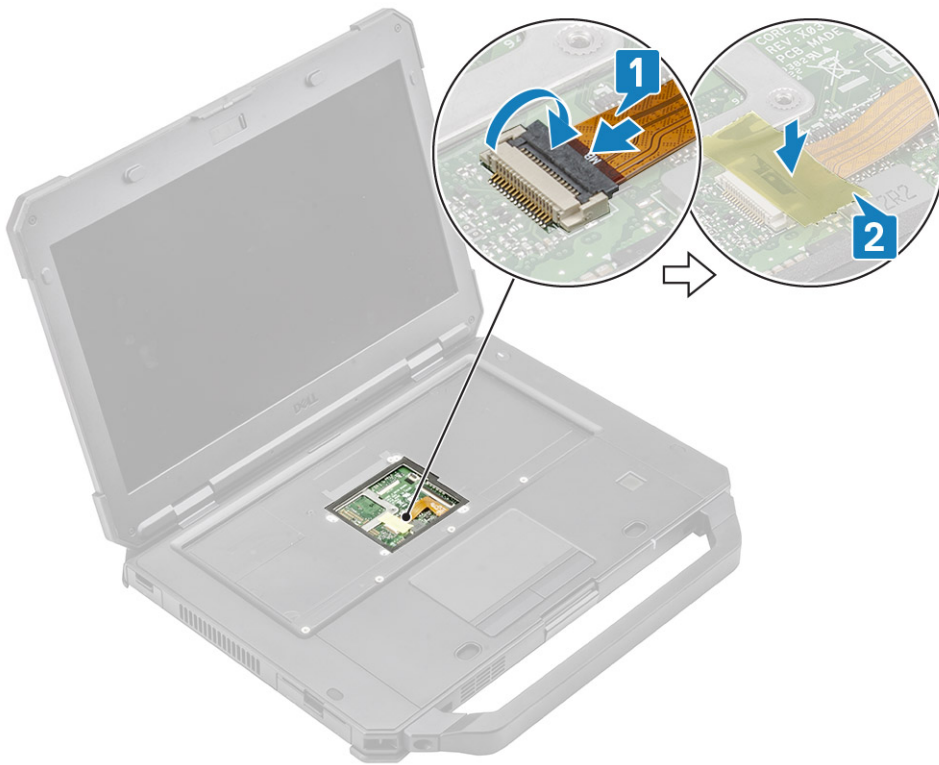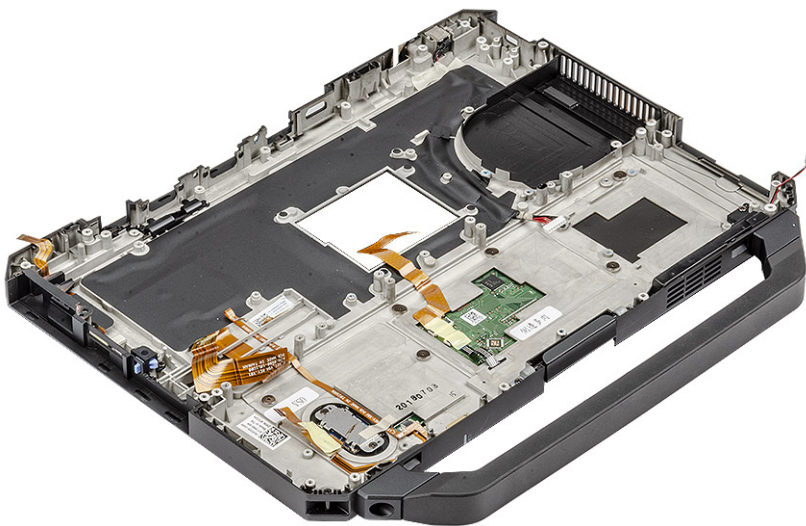
13. Install the:
    a. Rear I/O board
    b. Battery bay
    c. Primary SSD rail
    d. GPS module
    e. WWAN card
    f. WLAN card
    g. Memory
    h. Heatsink
    i. Primary SSD
    j. Docking port assembly
    k. PCIe heatsink assembly
    l. Keyboard
    m. Bottom chassis cover
    n. Batteries
14. Follow the procedure in After working inside your computer.

Bottom Base Assembly

1. Follow the procedure in Before working inside your computer.
2. To replace the bottom base assembly, remove the following components from old base:
    a. Handle
    b. Latched Doors
    c. Batteries
    d. Primary SSD
    e. Bottom chassis cover
    f. Keyboard
    g. WWAN card
    h. WLAN card
    i. GPS module
    j. Memory

k. Coin cell
l. PCIe heatsink assembly
m. Primary SSD rail
n. Docking port assembly
o. Heatsink assembly
p. Rear I/O board
q. Display assembly
r. Primary SSD rail
s. Battery bay
t. Left I/O board
u. Smart card
v. System board

3. Reconnect the:
   ● Power Button
   ● Speakers
   ● DC-In cable
   ● USH Board
   ● Touchpad

ⓘ **NOTE:** See the order details to determine the exact specifics of subcomponents defined in the Bottom Chassis Assembly.

4. Install the following components to the new base:
   a. System board
   b. Smart card
   c. Left I/O board
   d. Battery Bay
   e. Primary SSD rail
   f. Display assembly
   g. Rear I/O board
   h. Heatsink assembly
   i. Docking port assembly
   j. Primary SSD rail
   k. PCIe heatsink assembly
   l. Coin cell
   m. Memory
   n. GPS module
   o. WLAN card
   p. WWAN card
   q. Keyboard

r. Bottom chassis cover
    s. Primary SSD
    t. Batteries
    u. Latched doors
    v. Handle
5. Follow the procedure in After working inside your computer.

Diagnostics

This chapter details the built in troubleshooting features to diagnose the Dell systems. It also lists the invoking instructions along with related information for each diagnostics method.

Topics:

ePSA Diagnostics

The ePSA diagnostics (also known as system diagnostics) performs a complete check of your hardware. The ePSA is embedded with the BIOS and is launched by the BIOS internally. The embedded system diagnostics provides a set of options for particular devices or device groups allowing you to:

- Run tests automatically or in an interactive mode
- Repeat tests
- Display or save test results
- Run thorough tests to introduce additional test options to provide extra information about the failed device(s)
- View status messages that inform you if tests are completed successfully
- View error messages that inform you of problems encountered during testing

ⓘ **NOTE:** The **Enhanced Pre-boot System Assessment** window displays, listing all devices detected in the computer. The diagnostics starts running the tests on all the detected devices.

Running ePSA diagnostics

Invoke diagnostics by either of the methods that are suggested below:

- **Tap F12** key on keyboard, as the Dell splash screen appears, until you get the message **Diagnostic Boot Selected.**
  - ○ On the one-time boot menu screen, use the Up/Down arrow key to select the **Diagnostics** option and then press **Enter**.
- Press and Hold **Function (Fn)** key on the keyboard and press the **Power button** to power on the system.

ePSA User Interface

This section contains information on ePSA 3.0's Basic and Advanced Screen.

ePSA opens the basic screen on start. You can switch to the advanced screen using the arrow icon at the bottom of the screen. The advanced screen shows detected devices on the left column. Specific test can be included or excluded only in the interactive mode.

ePSA Basic Screen

The Basic Screen has minimal controls which allows easy navigation for the user to start or stop the diagnostics.
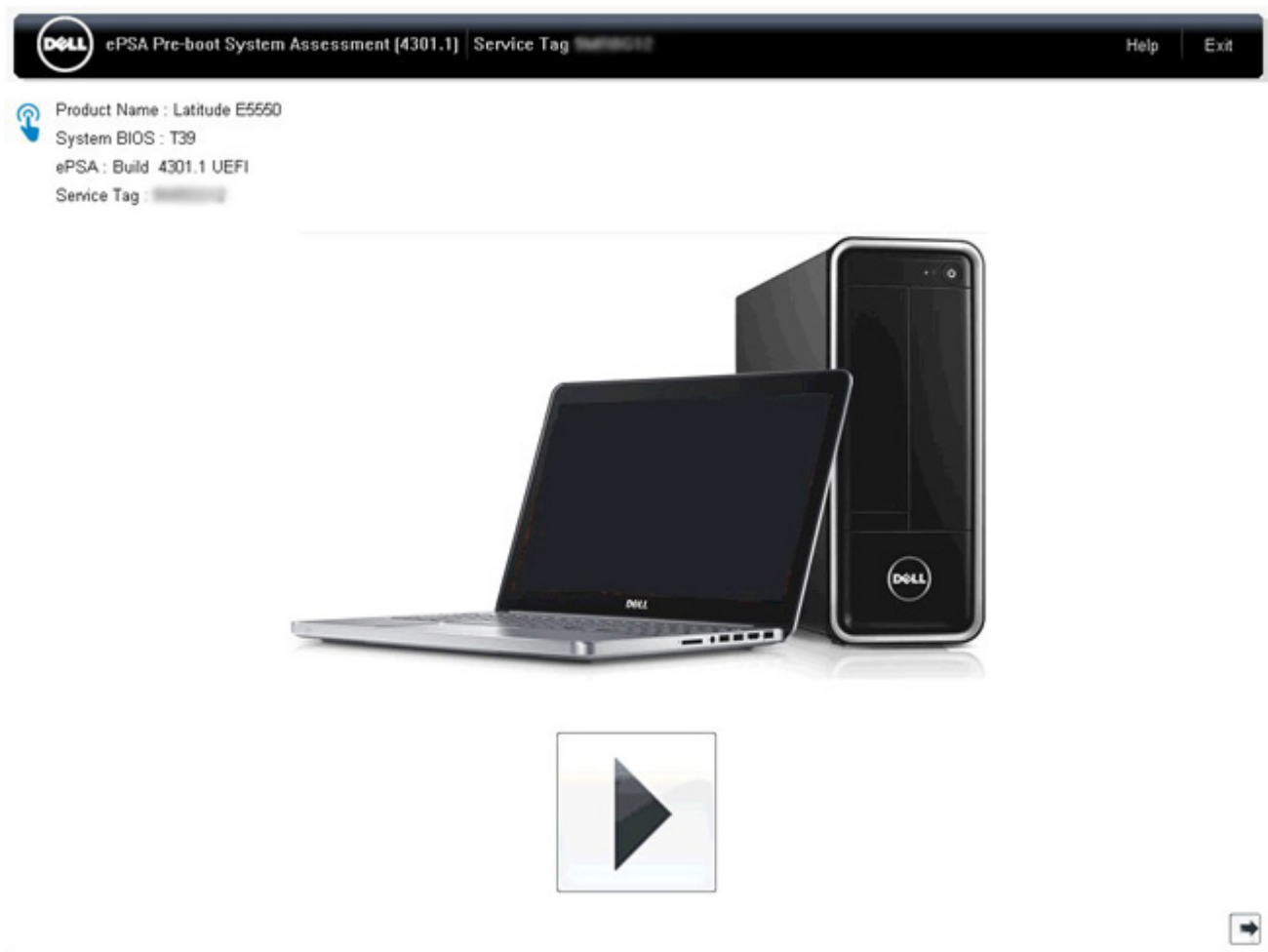
ePSA Advanced Screen

The advanced screen allows more directed testing and contains more detailed information about the overall health of the system. The user can get to this screen by simply swiping a finger to the left on touchscreen systems or clicking the next page button on the lower right hand side of the basic screen.
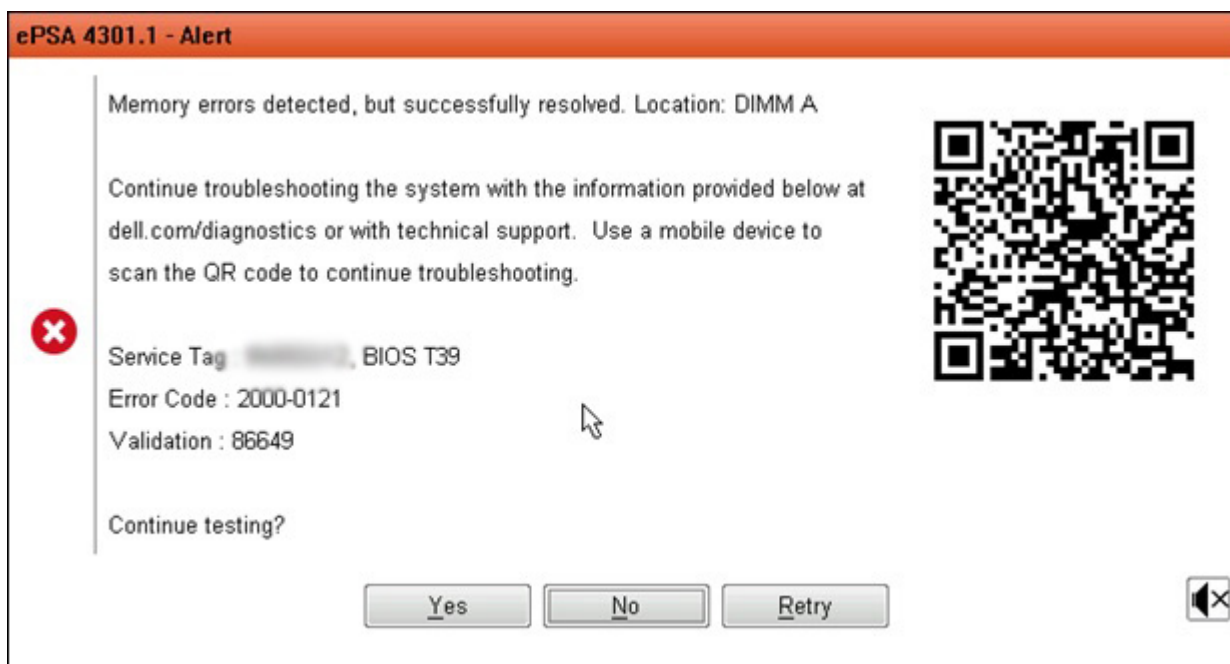
To run the test on specific device or run a specific test

1. To run a diagnostic test on a specific device, press Esc and click **Yes** to stop the diagnostic test.
2. Select the device from the left pane and click **Run Tests** or use **Advanced Option** to include or exclude any test.

ePSA Error Messages

When the Dell ePSA Diagnostic detects an error while running, it will pause the test and the following window is displayed:

ePSA 4301.1 - Alert

Memory errors detected, but successfully resolved. Location: DIMM A

Continue troubleshooting the system with the information provided below at dell.com/diagnostics or with technical support. Use a mobile device to scan the QR code to continue troubleshooting.

Service Tag   , BIOS T39
Error Code : 2000-0121
Validation : 86649

Continue testing?

Yes   No   Retry

- By responding **Yes**, the diagnostic will continue testing the next device and the error details will be available in the summary report.
- By responding **No**, the diagnostic will stop testing the remaining untested device.
- By responding **Retry**, the diagnostic will ignore the error and rerun the last test.

Capture the error code with Validation code or Scan QR code and Contact Dell.

ⓘ **NOTE:** As part of the new feature, user can now mute the beeping sound code when there is an error by clicking on 🔇 at the bottom right side of the error window.

ⓘ **NOTE:** Some tests for specific devices require user interaction. Always ensure that you are present before the computer when the diagnostic tests are performed.

Validation Tools

This section contains information on how to validate the SupportAssist ePSA, ePSA or PSA error codes.

Error code verification can be done using below two methods :

- Online Enhanced Preboot System Assessment Validation Tool.
- QR scanning using QR APP on Smart Phone.

Online SupportAssist On-board Diagnostics, ePSA or PSA Error Codes Validation Tool

Usage Guide

1. User to obtain information from SupportAssist error windows.

ePSA 4300.03 - Alert

Hard Drive - No Hard Drive detected

Continue troubleshooting the system with the information provided below at dell.com/diagnostics or with technical support. Use a mobile device to scan the QR code to continue troubleshooting.

Service Tag : ██████, BIOS 0.4.1
Error Code : 2000-0141
Validation : 125870

Continue testing?

| Yes | No | Retry |

2. Navigate to https://www.dell.com/support/diagnose/Pre-boot-Analysis.

3. Enter error code, validation code, and service tag. Part serial number is optional.

Error Code (without 2000-prefix) *	Error Code (without 2000-prefix)
Validation Code *	Validation Code
Service Tag ℹ *	Service Tag
Part Serial # (optional)	Part Serial # (optional)

Submit

View System Requirements and Privacy And Legal Information

ℹ **NOTE:** For error code, use only the last 3 or 4 digits of the code. (user can enter 0142 or 142 instead of 2000–0142.)

4. Click on **Submit** once all the necessary information is entered.

Error Code (without 2000-prefix) *	0141
Validation Code *	125870
Service Tag ℹ *	▓▓▓▓
Part Serial # (optional)	Part Serial # (optional)

Submit

View System Requirements and Privacy And Legal Information

Valid Error Code Example

After entering the correct information, the online tools will direct the user to the above screen which contains information on :

● Confirmation of the error code and result outcome
● Suggested Part Replacement

- If customer is still covered under Dell Warranty
- Case reference number if there is an open case under the service tag

Invalid Error Code Example

Error Code (without 2000-prefix) *	0141
Validation Code *	123456
Service Tag ℹ️ *	██████
Part Serial # (optional)	Part Serial # (optional)

⚠️ You have entered an invalid ePSA request, please check your details and try again.

Submit

QR APP Validation Tool

Besides using the online tool, customers can also validate the error code by scanning the QR code with a QR APP on a smartphone.

1. User to obtain the QR code from SupportAssist On-board Diagnostics error screen.

2. User can use any QR code scanner application through the smartphone to scan the QR code.

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to

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Place a barcode inside the viewfinder rectangle to scan it
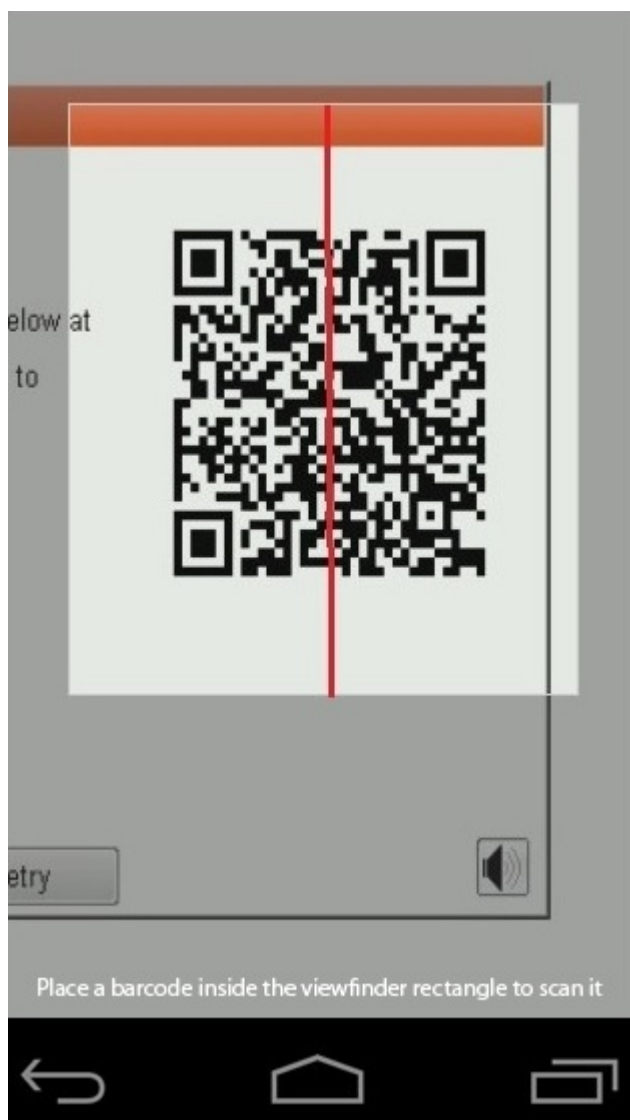
3. The QR code scanner application will scan the code and automatically generate a link. Click the link to proceed.
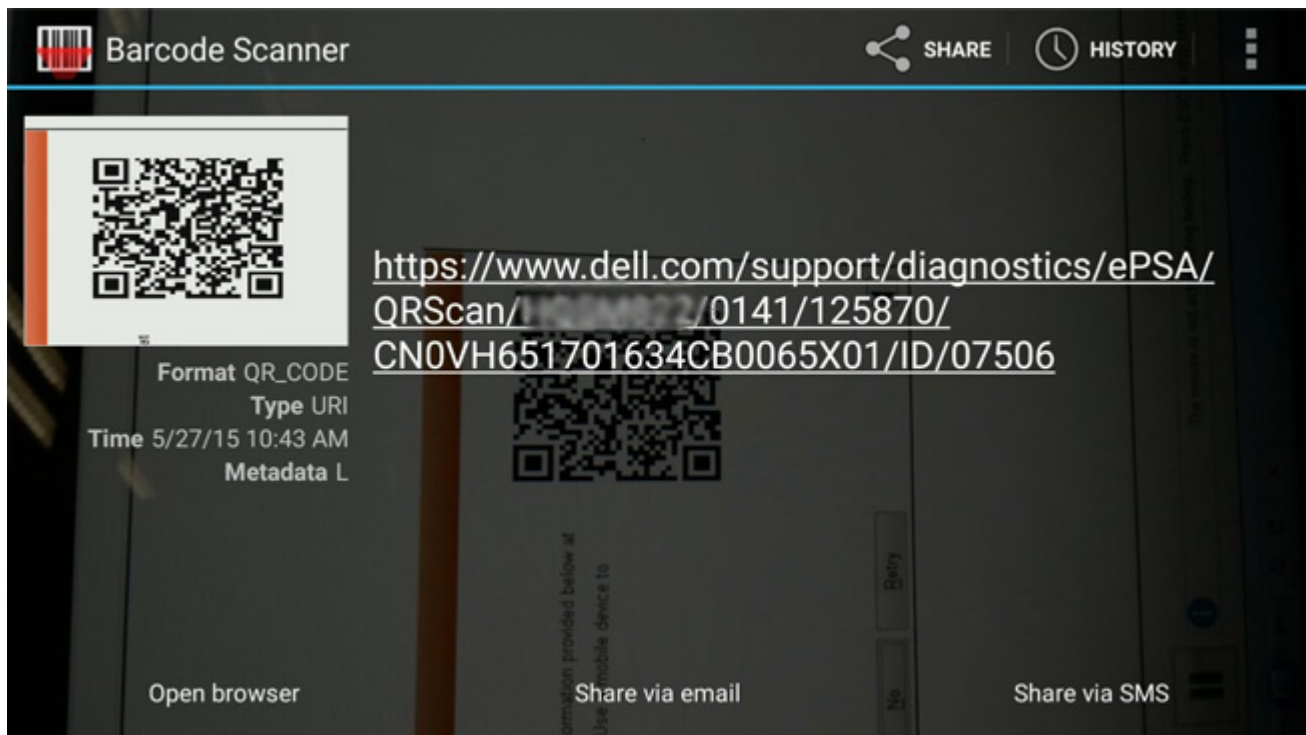
The link generated will take the customer to the Dell Support website which contains information on:

- Confirmation of the error code and result outcome
- Suggested Part Replacement
- If customer is still covered under Dell Warranty
- Case reference number if there is an open case under the service tag

LCD Built-in Self Test (BIST)

Dell laptops have a built-in diagnostic tool that helps you determine if the screen abnormality you are experiencing is an inherent problem with the LCD (screen) of the Dell laptop or with the video card (GPU) and PC settings.

When you notice screen abnormalities like flickering, distortion, clarity issues, fuzzy or blurry image, horizontal or vertical lines, color fade etc., it is always a good practice to isolate the LCD (screen) by running the Built-In Self Test (BIST).

How to invoke LCD BIST Test

1. Power off the Dell laptop.
2. Disconnect any peripherals that are connected to the laptop. Connect only the AC adapter (charger) to the laptop.
3. Ensure that the LCD (screen) is clean (no dust particles on the surface of the screen).
4. Press and hold **D** key and **Power on** the laptop to enter LCD built-in self test (BIST) mode. Continue to hold the D key, until you see color bars on the LCD (screen).
5. The screen will display multiple color bars and change colors on the entire screen to red, green, and blue.
6. Carefully inspect the screen for abnormalities.
7. Press **Esc** key to exit.

> (i) **NOTE:** Dell SupportAssist Pre-boot diagnostics upon launch, initiates an LCD BIST first, expecting a user intervention confirm functionality of the LCD.

Battery Status Lights

If the computer is connected to an electrical outlet, the battery light operates as follows:

Alternately blinking amber light and green light	An unauthenticated or unsupported non-Dell AC adapter is attached to your laptop.
Alternately blinking amber light with steady green light	Temporary battery failure with AC adapter present.
Constantly blinking amber light	Fatal battery failure with AC adapter present.
Light off	Battery in full charge mode with AC adapter present.
green light on	Battery in charge mode with AC adapter present.

Diagnostic LED

This section details the diagnostic features of the battery LED in a laptop.

Instead of beep codes errors are indicated via the bicolor Battery Charge LED. A specific blink pattern is followed by flashing a pattern of flashes in green, followed by white. The pattern then repeats.

ⓘ **NOTE:** The diagnostic pattern will consist of a two digit number being represented by a first group of LED blinks (1 through 9) in green, followed by a 1.5 second pause with the LED off, and then a second group of LED blinks (1 through 9) in white. This is then followed by a 3 second pause, with the LED off, before repeating over again. Each LED blink takes 0.5 seconds.

The system will not shutdown when displaying the Diagnostic Error Codes. Diagnostic Error Codes will always supersede any other use of the LED. For instance, on laptops, battery codes for Low Battery or Battery Failure situations will not be displayed when Diagnostic Error Codes are being displayed:

Table 26. LED pattern

Blinking pattern		Problem Description	Suggested Resolution
Green	**White**		
2	1	processor	Processor failure
2	2	system board, BIOS ROM	System board, covers BIOS corruption or ROM error
2	3	memory	No memory/no RAM detected
2	4	memory	Memory failure/RAM failure
2	5	memory	Invalid memory installed
2	6	system board; chipset	System board/ chipset error
2	7	display	Display failure
3	1	RTC power failure	Coin-cell battery failure
3	2	PCI/Video	PCI/Video card/chip failure
3	3	BIOS recovery 1	Recovery image not found

Table 26. LED pattern (continued)

Blinking pattern		Problem Description	Suggested Resolution
Green	**White**		
3	4	BIOS recovery 2	Recovery image found but invalid
3	5	Power Rail Failure	EC ran into power sequencing failure
3	6	SBIOS Flash Corruption	Flash corruption detected by SBIOS
3	7	ME Error	Timeout waiting on ME to reply to HECI message

WiFi power cycle

If your computer is unable to access the Internet due to WiFi connectivity issues, a WiFi power cycle procedure may be performed. The following procedure provides the instructions on how to conduct a WiFi power cycle:

> (i) **NOTE:** Some ISPs (Internet Service Providers) provide a modem/router combo device.

1. Turn off your computer.
2. Turn off the modem.
3. Turn off the wireless router.
4. Wait for 30 seconds.
5. Turn on the wireless router.
6. Turn on the modem.
7. Turn on your computer.

BIOS recovery

The BIOS recovery is designed to fix the main BIOS, and cannot work if the boot is damaged. The BIOS recovery will not work in the event of EC corruption, ME corruption, or a hardware related issue. The BIOS recovery image should be available on the unencrypted partition on the drive for BIOS recovery feature.

Rollback BIOS feature

Two versions of the BIOS recovery image are saved on the hard drive:

- Current running BIOS (old)
- To-be-updated BIOS (new)

The old version is already stored on the hard drive. The BIOS adds new version to the hard drive, maintains the old version, and deletes other existing versions. For example, A00 and A02 versions are already on the hard drive, A02 is the running BIOS. The BIOS adds A04, maintains A02, and deletes A00. Having two BIOS version enables the Rollback BIOS feature.

If the recovery file cannot be stored (hard drive is out of space), the BIOS sets a flag to indicate this condition. The flag is reset in the event it later becomes possible to store the recovery file. The BIOS notifies the user during POST and in BIOS Setup, the BIOS recovery is degraded. BIOS recovery through hard drive may not be possible, however BIOS recovery through USB flash drive is still possible.

For USB key: root directory or "\"

BIOS_IMG.rcv: the recovery image stored on the USB key.

BIOS recovery using hard drive

(i) **NOTE:** Ensure that you have the previous version and the latest version of the BIOS from the Dell support site available to use.

(i) **NOTE:** Ensure that you have the file type extensions visible in the operating system (OS).

1. Browse to the location of the BIOS update executable (.exe) files.
2. Rename the BIOS executable files to **BIOS_PRE.rcv** for the earlier version of the BIOS and **BIOS_CUR.rcv** for the latest version of the BIOS.
   For example, if the latest version's file name is **PowerEdge_T30_1.0.0.exe**, rename it to **BIOS_CUR.rcv** and if the previous version's file name is **PowerEdge_T30_0.0.9.exe**, rename it to **BIOS_PRE.rcv**

   (i) **NOTE:**
   a. If the hard drive is new, there will be no operating system installed.
   b. If the hard drive has been partitioned at the Dell factory, there will be a **Recovery Partition** available.

3. Disconnect the hard drive and install the hard drive into another system that has a full operational operating system.
4. Start up the system and in the Windows operating system environment follow these steps to copy the BIOS recovery file to the **Recovery Partition**.
   a. Open a Windows Command Prompt window.
   b. At the prompt, type **diskpart** to start the **Microsoft DiskPart**.
   c. At the prompt, type **list disk** to list out the available hard drives.
      Select the hard drive that was installed in Step 3.
   d. At the prompt, type **list partition** to view the available partitions on this hard drive.
   e. Select **Partition 1** which is the **Recovery Partition**. The size of the partition will be 39 MB.
   f. At the prompt, type **set id=07** to set the partition ID.

      (i) **NOTE:** The partition will be visible to the operating system as **Local Disk (E)** to read and write data.

   g. Create the following folders in **Local Disk (E)**, **E:\EFI\Dell\BIOS\Recovery**.
   h. Copy both the BIOS files **BIOS_CUR.rcv** and **BIOS_PRE.rcv** to the recovery folder on **Local Disk (E)**.
   i. In the **Command Prompt** window, at the **DISKPART** prompt, type **set id=DE**.
      After the executing this command, the partition **Local Disk (E)** will not be accessible by the OS.
5. Shut the system down, remove the hard drive, and install the hard drive into the original system.
6. Start the system up and boot to System Setup, in the **Maintenance** section ensure that **BIOS Recovery from Hard Drive** is enabled in the **BIOS Recovery** section of the setup.
7. Press the power button to shut the system down.
8. Holding the **Ctrl and Esc** keys, press the power button to start the system up. Keep holding the **Ctrl and Esc** keys until the **BIOS Recovery Menu** page is displayed.
   Ensure that the **Recover BIOS** radio button is selected and click **Continue** to start the BIOS recovery.

BIOS recovery using USB drive

(i) **NOTE:** Ensure that you have the file type extensions visible in the operating system.

(i) **NOTE:** Ensure that you have downloaded the latest BIOS from the Dell support site and save it on your system.

1. Browse to the location of the downloaded BIOS update executable (.exe) file.
2. Rename the file to BIOS_IMG.rcv.
   For example, if the file name is PowerEdge_T30_0.0.5.exe, rename it to BIOS_IMG.rcv
3. Copy the BIOS_IMG.rcv file to the root directory of the USB key.
4. If not plugged in, plug in the USB drive, restart the system, press F2 to enter the System Setup, and then press power button to shut down the system.
5. Start the system.
6. While the system is starting up, press the **Ctrl+Esc** keys while holding the power button until the **BIOS Recovery Menu** dialog box is displayed.

7. Click **Continue** to start the BIOS recovery process.

   ⓘ **NOTE:** Ensure that the **Recovery BIOS** option is selected in the **BIOS Recovery Menu** dialog box.

8. Select the path on the USB drive where BIOS recovery file is stored(root directory or "\") and follow the on-screen instructions.

Self-Heal

Course Introduction

Self-Heal is an option that helps recover a Dell Latitude system from a No Post, No Power, No Video situation.

Self-Heal Instruction

1. Remove the primary battery and the AC adapter.
2. Disconnect the CMOS battery.
3. Release the flea power. Press and hold the power button down for 10 seconds or leave the system idle for 45 seconds.
4. Make sure the CMOS and primary battery are not plugged into the system.
5. Plug in the AC adapter. The system will auto power-on when the AC adapter inserted.
6. The system will start with a blank screen for a while and will shut down automatically. Watch for the LED lights (power, Wi-Fi, and HDD). It will turn on.
7. The system will try to restart twice and will boot on the third attempt.
8. Place the CMOS battery and the AC adapter back in the system.
9. If self-heal recovers the failure, update the system with the latest BIOS, and perform ePSA to ensure proper functionality of the system.

   ⓘ **NOTE:**
   - During installation or removal of any hardware, always ensure all data is backed up properly.
   - For instructions on how to remove or replace parts, visit the Assembly Disassembly.
   - Before beginning to work on the computer, follow the Safety Instructions.

Supported Latitude Models

ⓘ **NOTE:**
- Before replacing the system board, perform self-heal as a mandatory step.
- Latitude Self-Heal can be avoided when complete system tear-down is required to access the coin-cell battery.
- For the Latitude E7 Series (XX70), BIOS Recovery 2.0 should be performed as the primary step.
- In order to reduce troubleshooting time associated with Self-Heal, there is no mandatory requirement to reassemble the system. Technicians can initiate Self-Heal even with the system board exposed.
- **Do not touch** any of the exposed components or the system board to avoid shorting and static.
- If Self-Heal is unable to recover the failure, proceed with replacing the system board.

ⓘ **NOTE:**

Front-line Agent Action: Front-line agents must encourage the customer to perform this step before isolating the issue as a motherboard failure. If the customer is not comfortable performing the Self-Heal procedure, then please document the dispatch being created in 5GL. Advise the onsite engineers to perform the Self-Heal procedure as one of the mandatory initial steps. Advise them that if the Self-Heal procedure is unsuccessful, to continue with the regular troubleshooting before part replacement.

Onsite Engineer Action: The Latitude Self-Heal procedure has to be a mandatory initial step. If the Self-Heal procedure is unsuccessful, continue with the regular troubleshooting before part replacement. Document Self-Heal results in the call closure log (Self-Heal Pass or Fail).

Getting help

Topics:

- Contacting Dell

Contacting Dell

ⓘ **NOTE:** If you do not have an active Internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell product catalog.

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical support, or customer service issues:

1. Go to **Dell.com/support**.
2. Select your support category.
3. Verify your country or region in the **Choose a Country/Region** drop-down list at the bottom of the page.
4. Select the appropriate service or support link based on your need.